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ENGINEERING FINANCE COMMERCE

ALTRUISM versus HORSE SENSE

By George Bronson Rea

MAINTENANCE OF CHINA'S INTEGRITY
IN MANCHURIA AND MONGOLIA

COLONIES FOR EVERYONE BUT JAPAN

WHERE IS JAPAN'S CAPITAL TO COME
FROM?

JAPAN'S NEW POSITIVE STATE POLICY

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OH WHERE, OH WHERE IS THE
CONSORTIUM

JAPANESE MACHINERY IN CHINA

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SHANGHAI, PEKING, TOKYO AND MANILA

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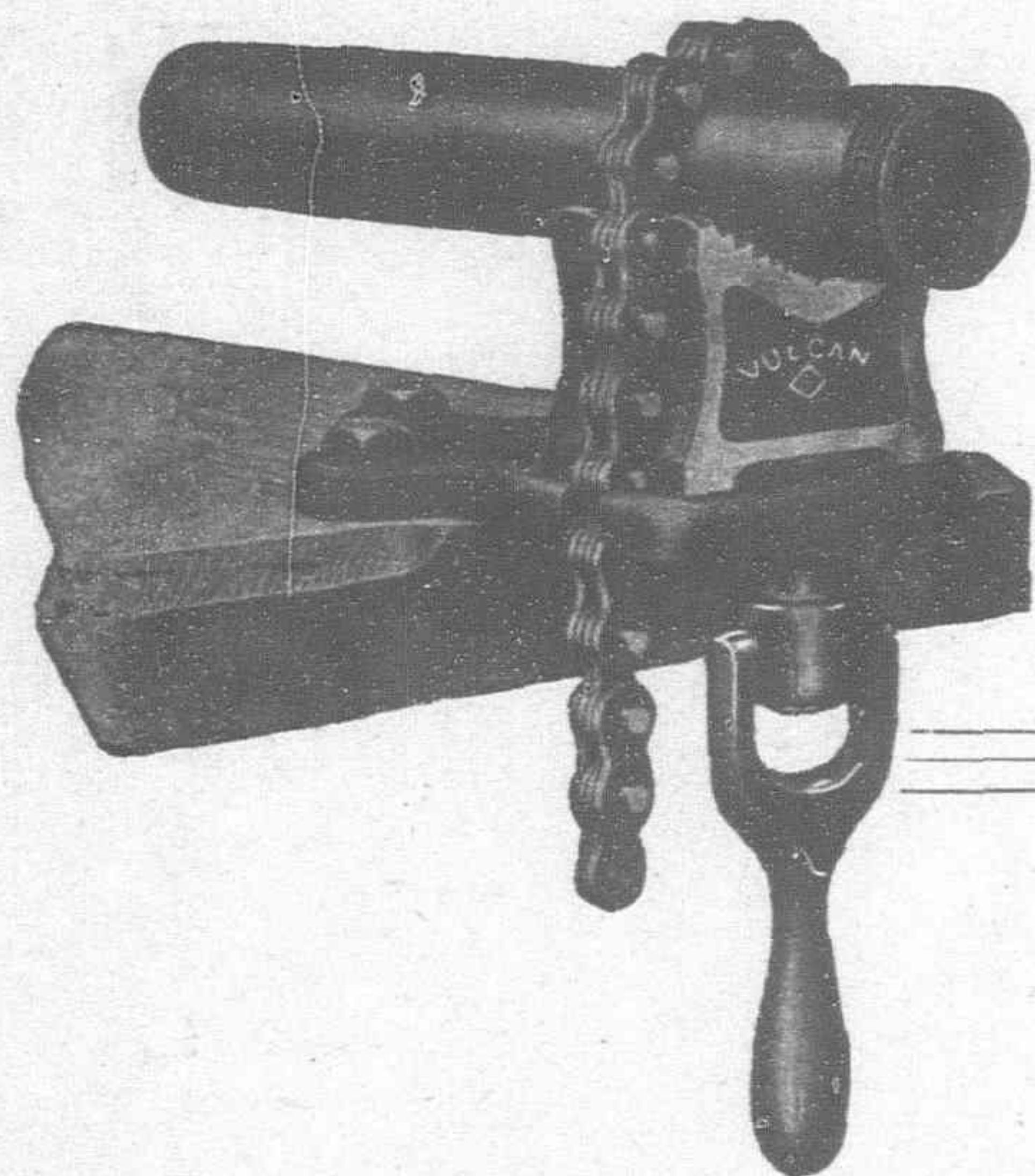
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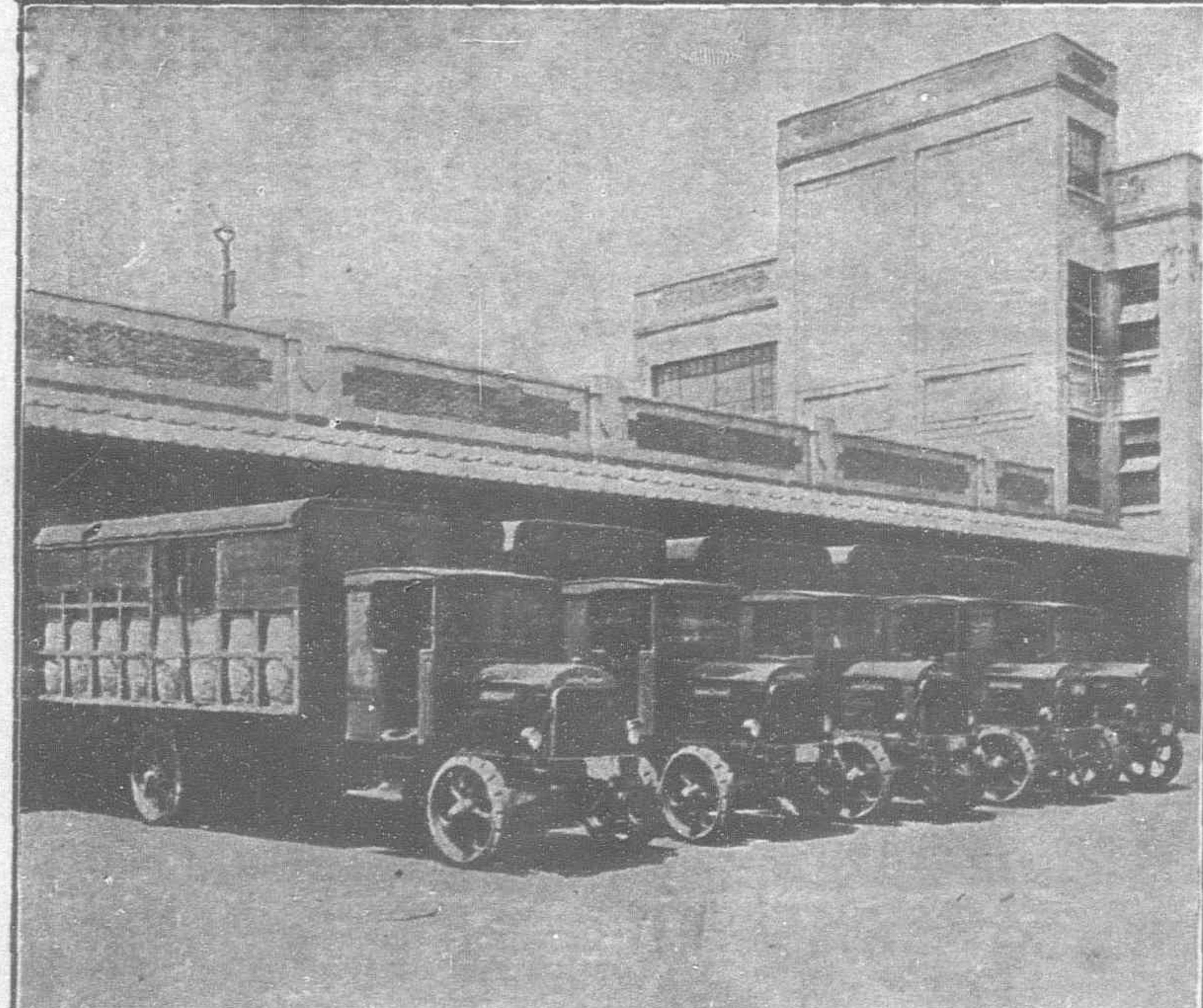
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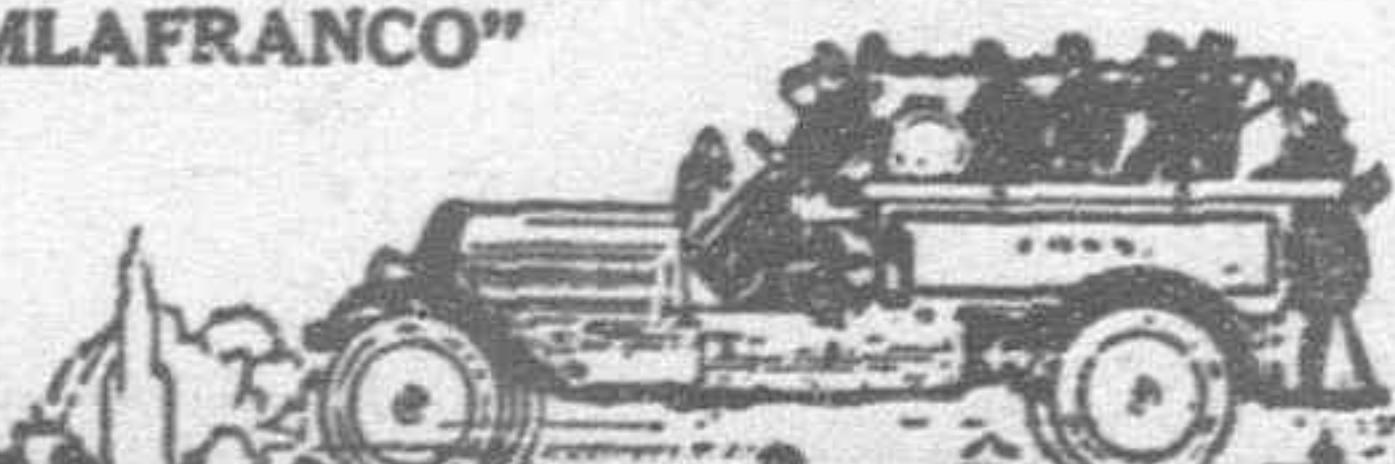
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The Far Eastern Review

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No. 10

Altruism versus Horse Sense

Let Down the Bars in the Philippines!

A Pre-Requisite to Economic Prosperity and Independence

It is not often that the *Far Eastern Review* calls attention to itself. Yet, it cannot be altogether a coincidence that in May 1924 in an editorial by Mr. George Bronson Rea, entitled, "Altruism versus Horse Sense," a policy was suggested which is clearly now the adopted policy of the President of the United States. The visit to the Philippines of Col. Carmi Thompson apparently has for its purpose the investigation of economic conditions in the Philippines with a view toward definitely determining upon a revision of the American state policy in the Islands. In this connection, it is interesting to recall several paragraphs of Mr. Rea's previous article :

In the Philippines, after twenty-five years of altruistic rule catering to the purely social and political betterment of the native, elevating them to the level of their tutors at a sacrifice of their material well-being, we find instead of gratitude, an insistent demand for immediate independence. American methods in the Philippines have simply created another South American state, in which with all avenues for industrial development closed, the graduates of the many schools and colleges have taken to politics as a duck does to water. Educated far beyond the requirements of the industrial life of the country and with no place to put into practice the learning acquired, it is natural for these high-collar graduates to seek government jobs. Had they been provided with an opportunity to work through the development of insular resources hand in hand with cultural progress, the Philippines to-day would have been in a better position to embark on an independent adventure.

For the present at least the Japanese program, despite its initial mistakes and harshness, has brought economic prosperity and physical contentment to the people of Formosa and Korea, a good ground for further uplift work. They can now stand on their own bottom without help from the Metropolis. They have established a solid foundation on which to erect a political superstructure that will endure. In the Philippines these conditions are reversed. An economic foundation that will bear the weight of political independence is lacking. American concern for the future of their wards and an overzealous desire to protect them from spoliation has prevented the free influx of capital and labor to develop their resources. What prosperity they enjoy is derived from the remission of American duties on sugar and tobacco, a free gift from the American treasury. Take away this favored tariff position by conceding independence and there remains no foundation on which to erect a lasting political edifice. To maintain their independence and provide the funds to keep their heads above water as a going concern, the doors of an independent Filipino republic will have to be opened to Chinese and Japanese labor and capital. They will have to start at the bottom of the economic ladder and even under the most favorable conditions, it will take them another two or three decades to arrive where Formosa is to-day.

With a population of 3,500,000, the annual income of the Formosan government is about \$50,000,000 gold while the Philippine government exercising jurisdiction over 11,500,000 people, ekes out an existence with revenues totalling about \$32,000,000. With the vastly superior natural resources of the islands and working under a program similar to Japan's in Formosa the insular revenues should now be \$150,000,000, or even more. As a purely commercial and economic proposition the Japanese program has benefitted Formosa five times as much as the application of American ideals in the Philippines.

Politically, the Filipinos have been educated until they can stand alone. The sweeping demands for independence now voiced by all factions and parties is an indication that the *politicos* are seeking some way in which they can create an economic prosperity and provide occupations for the educated classes. The laws as they now stand maintain the islands closed to capital, closed to labor and closed, therefore, to economic development. We have fed them cake when they cried for bread. They are surfeited with sweets and want something more substantial. They seek this through complete independence, starting their new life well equipped in mind and morals but like most college graduates, without a cent of capital other than their brains. They will probably go farther in the long run, but they will have to work harder.

If we are to preserve intact the present laws which militate against the investment of foreign capital on a large scale and apply our Asiatic exclusion laws in an Asiatic country, the islands will never be developed and never reach that point where they can stand alone. In other words, under these conditions the time will never arrive when America can sever relations with the islands. Such a program is immoral, an insult to the intelligence of the American people and a millstone around the neck of the Filipinos.

Let down the bars in the Philippines so that capital and labor can create that firm economic foundation upon which a stable and efficient government can operate. Give the Filipinos bread to eat instead of pap and let them work out their own destiny. Work out a balance sheet of our trade with China and include those invisible exports of missionary and philanthropic gold added to the millions sent home each year by the Chinese residing in America and find out just where we stand. If we insist upon remaining in the philanthropic business, let us back up our uplift campaign with the millions that will create an economic basis in China so that our missionary endeavors will bring material returns in the future.

COLONEL Carmi A. Thompson has completed his survey of conditions in the Philippines and is now on his way to report to President Coolidge. The report, we are told, will be maintained secret until released for publication, but enough has leaked out to sustain the conjecture that it urges the fullest development of insular resources as the indispensable requisite to eventual

independence. It could not be otherwise. There is no other conclusion to draw from such a mission, for the simple reason that there was nothing left to report upon in the Islands after the Woods-Forbes Mission went through them with a fine-tooth comb. The basic political and economic conditions have not changed since that report was submitted, nor are they likely to change so long as the

Islands remain under our tutelage. We have done everything else for the Filipino except give him a chance to develop his resources. We have educated and elevated him socially, politically and morally and then erected barriers which operate to prevent him from putting these qualities to the test in the struggle for existence.

To save them from bankruptcy and undo the mistakes of his predecessor, President Harding sent to Manila as Governor General one of our greatest national figures. Yet we took this executive who typifies all that is best in our national life, upon whose success or failure hinges our standing and prestige in Asia, and asked him to carry through a thankless and herculean task. We shackled him hand and foot and sent him to Manila to become the sport of the Filipino *cacique*. If we lose out in the Philippines, if our prestige in the Far East goes, as it will go when we get out of the Islands, we will get just what is coming to us for the shabby treatment accorded to Leonard Wood.

Is it too late in the day to retrieve our mistakes in the Islands? Whether we like to admit it or not, the American people are morally obligated by all laws of Right and Justice to grant the Filipinos their full independence. It must come sooner or later. The Philippines cannot always be made the football of national politics. We cannot go on indefinitely holding a people against their will. Such a course is criminal aggression of the worst type, a negation of all the high ideals upon which our own national life and institutions are founded. The day that we definitely depart from our traditions and betray our principles, that day will mark the end of our experiment in government. There is no place in a Democracy for the machinery of Empire. We cannot hold subject peoples either as colonies, protectorates or territories except for a brief period in order to educate and prepare them for the opportunity to enter into our national life. The decision as to their ultimate relationship must rest with themselves. Sooner or later their status must be clearly defined. We have arrived at that point in our relations with the Philippines and if they are to realize their natural and just aspirations and assume their place in the family of free nations, it is our duty to prepare them in the shortest period possible for an economic independence that will enable them to maintain and defend their more cherished political freedom.

To turn them adrift on the stormy seas of Asiatic politics unequipped to hold their own, is an open invitation for the international loan shark to prey upon their necessities. Once their financial independence is mortgaged or circumscribed by loan restrictions, it would not be long before their political independence would be endangered. We repeat what we had to say in May 1924:

"If we are to preserve intact the present laws which militate against the investment of foreign capital on a large scale and apply our Asiatic exclusion laws in an Asiatic country, the Islands will never be developed and never reach that point where they can stand

alone. Under these conditions the time will never arrive when America can sever relations with the Islands. Such a program is immoral, an insult to the intelligence of the American people and a millstone around the neck of the Filipinos."

The admission of Chinese or Japanese labor into the Philippines is not urged in order to facilitate their economic exploitation or to deprive the Filipino from the full rewards of his labor in developing his own resources. The argument has a much higher bearing on the future of the Islands and unless it is recognized now, the exclusion of other Asiatics will stand as an insurmountable barrier to their recognition as an independent state. The Philippine Islands are part of Asia. Their inhabitants belong to the same racial group as the Siamese, Indo-Chinese, Malayans and Javanese. They are closely related to certain sections of the Japanese. Chinese blood flows through the veins of many of the best Filipino families. The Filipino is an Asiatic in every sense of the word and by extending our exclusion laws to cover the Islands we have taught one branch of the Asiatic family the dangerous practice of discriminating against his racial brothers. We can make it stick only just so long as the American flag waves over the Archipelago. The day the flag comes down and an independent Filipino republic enters on its international career, it must do so on a plane of full equality with its neighbors, or invite hatreds that will develop rapidly into reprisals, and actual warfare. The future peace, prosperity and trade relations of the Philippines are bound up in cordial relations with their immediate neighbors and it goes without saying that these cannot be assured with an Asiatic exclusion law standing in their statute books. The sooner Americans recognize this cardinal and fundamental truth and shape their program accordingly, the better it will be for the future of the Islands. If the Filipino must ultimately face this problem—and face it he must—it is to his advantage to face it now and accept the inevitable. He may delay under cover of American protection and continue to insult his neighbors, but the day will arrive when, of his own accord he will seek their friendship as a pre-requisite to the recognition of his country as an independent state.

Neither China nor Japan will ever enter into treaty relations with a petty Asiatic state which bars the entrance of their people for economical or any other reasons. History is being made with alarming rapidity in the orient and when the Western nations awaken to the true import of what is taking place, a militant China will have been borne out of the period of civil war and opposition to foreign pretensions and the nation which would then seek to foster in Asia its racial prejudices would be bold indeed. It is better for Americans and Filipinos to accept the situation gracefully than be forced to surrender. If it must be done eventually, why not now?

G. B. R.

The Maintenance of China's Integrity in Manchuria and Mongolia

An International Obligation on the Part of all Powers Attending the Washington Conference:
A Halt to Soviet Dismemberment of China
Manchuria and Japan's Food Problem

By George Bronson Rea

TOKYO, October 5.—Western immigration laws and the Chinese wall against foreign ownership of land outside the treaty ports, constitute an almost insurmountable barrier to the peaceful solution of Japan's pressing population problem by emigration. The vast virgin plains of Manchuria and Mongolia appear to be the only outlet for the mounting millions of Japan and the tendency of many American and European writers has been to over-estimate this possibility in any serious discussion

of Far Eastern problems. These territories belong to China and their development by Japanese settlers can be carried out successfully only with the full and cordial co-operation of the Chinese government and people. China's sovereignty may have been outraged by the Soviet's thinly veiled aggressions in Outer Mongolia and flouted by her manouvres in Northern Manchuria, but Japan has not lost sight of the cardinal political truth driven home in the Consortium and Washington Agreements, that Manchuria and

Mongolia are integral parts of the Chinese Republic, and sooner or later, the Consortium Powers will be compelled to enforce a doctrine that Japan was induced to recognize and respect. The safeguarding of China's integrity is therefore an international obligation which Japan has every right to expect will be shared equally by all the interested Powers should the occasion arise to call a halt to the Soviet dismemberment of China. When this supreme test of international sincerity can no longer be side-stepped, the United States would seem to be obligated to carry the brunt of enforcing respect for a principle that was rigorously applied in order to check Japan's expanding influence in these territories.

America's Part

Through her refusal to join the League, America has fortunately escaped being drawn into European complications that might lead to war, but her subsequent creation of and participation in a Far Eastern League of Nations founded on principles laid down by her own statesmen, very definitely commits her to take a firm stand in enforcing the objects of that coalition. If American public sentiment refuses to sanction such a radical departure from national traditions, thus throwing the burden of defending our basic Far Eastern doctrine upon Japan, we are morally committed to stand by her as a full Ally in such an enterprise, to the extent of financing her armies to prosecute the war our own diplomacy has made possible. American post war interference in Manchurian and Mongolian affairs opened the door to the Soviet advance in these regions. Japan's dreams of an outlet for her millions in Mongolia can now be realized only by ousting the Soviet by force of arms. This, Japan cannot do alone, and unless the other Consortium Powers combine with her to enforce respect for their own doctrine, Japan must seek a solution to her problems in some other direction.

China's Land Restrictions and Japan's Policy of Friendship

For a time it looked as though Japan might be compelled reluctantly to apply diplomatic pressure in order to induce China to modify her land laws sufficiently to facilitate the opening of these territories to settlement and development, but as matters stand at present, Chinese consent could carry little weight outside of South Manchuria. As long as Russia's position in Mongolia and Northern Manchuria nullifies China's sovereignty in these regions, no concession on the part of Peking or Mukden can effectively open them up to settlement. In the meantime, the pressure within Japan is steadily mounting, but instead of seeking an outlet through the safety valve of Manchurian or Mongolian colonization, the fact is becoming more and more impressed upon the world that no matter how desperate her internal situation may become, the present Rulers of Japan are unalterably opposed to any policy that may impair the present bright prospects of a lasting and secure Sino-Japanese understanding. Under no circumstances compatible with national honor, will Japan endanger her growing friendship with China. Someday perhaps, the issue of Russia's permanence in Mongolia and Manchuria will be squarely faced by China herself and the Sino-Japanese Military Pact concluded during the Great War and abrogated under pressure from America and Britain, will then be revived under totally different conditions. By that time, the military power of China will be such that she will brook no interference from outside sources.

Japan and Soviet Russia

It is also becoming more and more evident that Japan does not intend to be drawn into any single-handed conflict with Russia over the violation of principles, which, although affecting her interests more vitally than those of any other nation, are equally the concern of all, and as there is no intimation or indication that the other interested powers will take forcible steps to compel respect for the doctrines they originated, Japan is determined to safeguard her own position through a peaceful understanding with Russia. The time may arrive when in order to defend her vital economic interests and rights in South Manchuria, Japan may be forced to fight, but even with the prospect of a brilliant victory, public opinion in this country will never support any quixotic adventure for the mere preservation of China's sovereignty that will once more plunge the nation into industrial chaos and financial ruin. In plain words, Japan does not intend to fight Russia on behalf of a people who show no disposition to fight for themselves, or to please other interested Powers who have everything to gain through her sacrifice. Some years ago, a group of Chinified American fanatics thought it was the sacred duty of their country to lick the tar out of Japan in order to right the wrongs of "poor, old, innocent and defenseless China," but they overlooked the essential fact that no level-headed American would go to war for four hundred million confirmed pacifists who would not fight for themselves. By the same logic neither does Japan intend to sacrifice herself on the altar of Chinese pacifism by fighting Russia to a standstill over a principle which would once more be advanced by the other Powers in order to deprive her of the legitimate fruits of victory. Japan has been stung several times by permitting herself to be used to safeguard the rights of other powers in China and is now determined to look out for her own interests in her own way. Peaceful commercial and industrial expansion in Manchuria and Mongolia is the key-note of Japan's program in these regions and she welcomes foreign, especially American, co-operation in the development of these undertakings. Such co-operation is the surest guarantee that China's sovereignty will be fully respected and safeguarded, the answer to anti-Japanese arguments that such a union of interests would be used by Japan to further her own political ends. Naturally, in view of the unsettled political conditions in these territories, Japan is taking no chances against possible encroachments of Soviet Russia of being unable to defend her position. Industrial and agricultural development of Manchuria and Outer Mongolia must proceed hand in hand with new railway construction, which, from the very nature of the ground, have an important strategical bearing on China's ability to defend herself against aggression, or, in the event the rightful sovereign is too weak to enforce respect for its rights, Japan can come to her aid without loss of time.

Japan Must be Prepared

As long as Soviet Russia adheres to her present aggressive tactics in Central Asia and Mongolia, Japan must be prepared against any emergency and if China is unwilling or unable to exercise her sovereign authority, then the time may conceivably arrive when that authority may have to be strengthened by the armed support of Japan. Japan will not seek expansion at the expense of China. Whatever outlet may be created in Chinese territories for the surplus millions of Nippon will come as the result of peaceful negotiations based on a full recognition of China's sovereign rights as laid down in the Washington treaties. That, as I see it, is the present trend of Japanese policy in Manchuria.

Colonies for Everyone But Japan

WHAT then can Japan do to relieve the pressure from within? Great Britain and France may find some way within the machinery of the League to preserve the peace of Europe by satisfying the colonial demands of Germany and looking out the window while Italy lets off its superheated steam in some weaker neighbor's back yard. France may relinquish her mandate over Togoland or Britain may appease Germany with a slice of Tanganyika. They may also take a *siesta* while Italy wipes out the disgrace of Adowa and swallows a chunk of

Abyssinian pie. There are ways and means even within the machinery of the League to justify such aggressions and propitiate the two great land hungry nations of Europe; but what about Japan? Nothing can be done within the League for either Germany or Italy without Japan's consent, and should she mould her diplomacy on the give and take basis of Europe, there would have to be found some compensation in order to secure her vote. If such compensation be denied and Japan should veto the plans of Europe, another situation similar to the one in which Brazil threw the monkey

wrench into the League machinery would be precipitated at Geneva. Japan's problems are more pressing for solution than those of Italy or Germany, but what can the League do for her? Would Great Britain, France, Belgium or the Union of South Africa, consent to surrendering or sharing their mandates in Africa with Japan? Hardly. Would Australia or New Zealand hand over any of the South Sea Islands to Japan?

Practically half of the great island of New Guinea is under the mandate of Australia who cannot colonize it with its own people for another century. Suppose Japan should make the transfer of Australia's mandate a condition to her acceptance of any reshuffle of the African map in favor of Italy or Germany? What would happen? The administration of these territories have been entrusted by the League to the various Allied Powers "*as a sacred trust of civilization.*"

Australia's View Purely Political

In the interests of civilization, it would seem therefore that the League has the power to make any changes deemed necessary to further these high ideals. Australia cannot develop its own resources let alone take over the obligation of administering another nearby island continent sparsely peopled by savages so opposition to surrendering her mandate to Japan could therefore be based solely on political grounds, an argument that vitiates itself when considered in connection with the constitution and objects of the League. In other words, there exists no valid economic or humanitarian reasons why Japan should not be entrusted with the mandate for New Guinea, and should she make this a condition for her vote to any readjustment to the present mandatory system, the League would either have to accept or face disruption.

No Interference with European Affairs

This contingency is, however, purely hypothetical. The present attitude of the Japanese Government is one of friendly neutrality, a disinclination to interfere with the affairs of Europe except where her own interests are involved. Should the question of restoring Germany's colonies be raised at the next session of the League, as now seems certain, Japan will probably acquiesce in any readjustment of African mandates that meet with the unanimous consent of the European Powers concerned, provided that her own mandatory over the ex-German Pacific islands is not impaired or called into question. The present trend of thought in official Japan on this subject, however, may undergo a radical change under a new ministry confronted with the imperative necessity of easing off the internal pressure, and if the League in order to avert a calamity, decides that a readjustment of mandates in Africa is essential to preserve European peace, the same reasoning must be applied to further the sacred cause of civilization in other parts of the world.

New Guinea for Japan

The only remedy within the scope and powers of the League that could relieve the situation in Japan is a reshuffle of the South Sea mandates that would transfer New Guinea from Australian to Japanese control. Japan was compelled by the pressure of world opinion and the Washington conference to surrender the German rights in Shantung ceded to her in the Versailles Treaty, and if the other signatories to that pact now agree amongst themselves to transfer some of their African spoils to appease the demands of Germany and Italy, equal consideration should be shown to Japan in the Pacific.

The League cannot apply one principle in one part of the world to further the sacred cause of civilization and decline to extend the same principle to a solution of Japan's problems without confessing that its high ideals are applicable exclusively to preserving the European conception of civilization and were never intended to cover the equally hallowed rights of an Asiatic nation. The world has viewed with considerable alarm the threats and boasts of Mussolini to find a place in the sun for the prolific sons of Italy. There is every evidence that Mussolini meant exactly what he said in the early part of the year. Why has he delayed carrying out his bluff, if bluff it was? The world is yet ignorant of the preliminary secret talks and correspondence between Downing Street and the Quirinal which led up to the publication of the Anglo-Japanese

exchange of notes over Abyssinia. It also remains in profound ignorance of the exact nature of the recent conversations between Chamberlain and Mussolini. The Abyssinian pastime of raiding the British crown colony of Kenya and Italian Somaliland and carrying off the native subjects of these Powers into slavery may easily become a very legitimate pretext to justify drastic action against a slave-dealing member of the League of Nations.

On the other hand, we are informed by press dispatches that France has signified her willingness to hand back to Germany her former African colony of Togoland. Is this part of the Franco-German *entente* that is so visibly worrying England and Italy? For Germany has her heart set on re-entering into possession of her old East African colony now administered by Great Britain under the Tanganyika mandate. The British answer to the German campaign is clearly contained in the emphatic declaration made by Mr. Amery, Secretary of State for the Colonies, before the annual East African dinner last year:

"We have got rid of that intrusive block of German territory which, under the name of Tanganyika Territory, has now been permanently incorporated in the British Empire. I stress that—permanently. It is an entire delusion that it is less British than any other colony. It is essentially a part of the British Empire. Though we have laid ourselves under an obligation to the League of Nations, it is not one whit less British nor does it make our tenure there one whit less permanent."

The Mussolini-Chamberlain Interview

Australia and New Zealand are equally emphatic in declaring that they will not surrender control over their Pacific mandates unless turned out by force. Its a pretty tough proposition to pry loose the Anglo-Saxon from any particular piece of territory he has once nailed down and daubed red on the maps of the world and from the foregoing expressions of opinion it is highly impracticable that Great Britain or her Dominions will fall over themselves in haste to purchase German good-will by restoring what they took away from her in a fair fight. So if the British refuse to accept any modification of the Versailles treaty, it is difficult to understand how Germany or Italy can be propitiated without acquiescing in some aggression against the rights of a weaker state.

The Mussolini-Chamberlain interview undoubtedly fully covered these highly interesting topics in order to arrive at some understanding before Germany raises the question of her lost colonies. In the new line-up for control of the Mediterranean, Britain's position is not nearly as strong as it used to be. Italy now holds the key to the All-Red Route and can close the passage at any time by her submarine fleets and air squadrons. Gibraltar remains the entrance, but from the toe of the boot and the point of Sicily to the African shore, Italy is the toll-keeper. The Eastern Mediterranean is now an Italian Lake, a development of post-war strategy arising out of Italy's new born strength that Great Britain has been forced to recognize. It is logical to assume that under these changed conditions, Italy will not gracefully assent to any restoration of the German colonies when she still rankles under the snub which denied to her a legitimate share of the spoils at Versailles. Italy is no longer a suppliant for favors from her old associates, and in any new adjustment of territorial boundaries her request for more elbow room must receive preferential treatment. If the tactics of Versailles are repeated and Italy once more treated as the under dog by her Allies, Mussolini will probably make good his threats and take such steps as he considers necessary to relieve the Italian pressure.

It would seem therefore that the next assembly of the League will be more entertaining than the historical tea fights of last March. If Japan descends to the level of Europe and plays the game of diplomacy in the same cold-blooded, calculating manner as her associates, it will be a lively session. Unless all signs fail, the smallest member may become the biggest player with the strongest hand. "Little Ishii," as he is affectionately called by his colleagues, holds the winning cards, and should his government elect to play the game strictly according to European Hoyle and demand New Guinea as Japan's price for peace in Europe, when he calls for a show-down, the will win the pot, or, some player will throw down his cards and reach for his gun.

Where is Japan's Capital to Come From?

AFTER all, the transfer of New Guinea to Japan is a very small price to pay for the solution of a Pacific problem which is each year becoming highly intensified by the alarming increase of Japan's population. It is sheer molly-coddle folly to argue that birth-control can regulate or dam such a tremendous force or that the steadily mounting pressure can be safely confined by industrialization. Japan is a poor country with neither the wealth or the borrowing capacity to provide the huge amounts of capital required to create industries fast enough to give employment to 800,000 new people a year. Granted for the sake of argument that foreign capital co-operating with Japan might partially relieve the situation through the establishment of new industries; where is this capital to come from? Certainly not from an impoverished Europe. It must come from the United States, and here Americans would find a much more profitable and secure field for the investment of their surplus wealth than they are now finding in an unappreciative and back-biting Europe. The events of the past year are convincing serious-minded Americans that no matter what they may do to relieve the financial and industrial situation in Europe, the worse they will be hated, and, if in the natural revulsion of feeling they seek a new outlet for their wealth in lands across the Pacific they will be well advised to study carefully the opportunities presented by a fifty-fifty co-operation with Japan. Such co-operation in developing the industries of Japan will eventually bring the entire Asiatic market under Japanese-American domination, while dumping our millions into Europe simply means the strengthening of industrial rivals who will use American loans to undermine our foreign trade and then call on us for further millions to refund the loans when they are due for repayment. For it is now an accepted fact that Europe's debts to America will never be paid in full. The best we can hope for is to continue to pour further millions into Europe in order to save what we have already invested and in the meantime see this capital employed to kill our export trade.

Japan Does not Compete with America

The same argument might apply also to Japan along certain lines, but careful analysis will reveal that there is a distinct dividing line between the interests of the two nations. Outside of cotton goods, and here only to a very limited extent, the manufactured products of Japan do not in any way compete with major American industries, nor can Japan ever hope to outdo us in those lines upon which the present prosperity of the nation is founded. It is true also that in electrical and some minor mechanical lines, Japan will in time not only manufacture all her own requirements but seriously compete with us in the Chinese and other low-priced Asiatic markets. But should our people be willing to accept a fifty-fifty split of the Asiatic business by co-operating with Japan, only the erection by other countries of an insurmountable tariff wall can prevent American and Japanese business methods from conquering and holding the markets of Asia. This subject, however, is only briefly touched upon here in order to point the way to a pacific solution of Japan's problems through an industrialization that Japan herself is too poor to carry through in time to avert an explosion.

Japan Meets Europe more than Half Way

A fleeting glimpse of Japan's difficulties in this connection may be gathered from the outstanding feature of her honest attempt to merit international good-will by adopting the regulations passed at the International Labor Conference of 1919 providing for ten-hour shifts and the abolition of night work for women in her textile mills. In the first place, it costs two to three times as much per spindle to erect a cotton mill in Japan than it does in England. Therefore, aside altogether from humanitarian or labor considerations, the Japanese mills must work two to three times longer than the British mills to get the same legitimate returns on the capital invested. To date, Japan has been able to hold her own by working day and night shifts of ten hours each and applying the most

efficient and up-to-date business methods in purchasing raw materials and marketing the manufactured products.

In Japan, the male considers it beneath his dignity to do work that traditions have relegated to the female. This is also true in many other countries. He cannot be induced even at a higher wage to take over the work in textile mills now monopolized by females. Consequently, the textile industry of Japan depends for its very existence upon the labor of women, and incidentally, upon the care and attention given to their comfort and well-being. Yet in order to carry out the International Labor regulations, Japan is preparing to abolish the night shift thus reducing the earning capacity of her principal manufacturing industry by one half and throwing out of employment one half of her female workers. The paid-up capital of the 232 cotton mills in the Japan Cotton Spinners' Association, is Yen 350,000,000, so in accepting the international regulations Japan decreases the earning capacity of this sum by one half. To provide the same amount of work and maintain her competitive trade position Japan must find another Yen 175,000,000 to erect new textile or other industrial establishments. This, at a time when she is fighting desperately against heavy odds to keep her head above water.

It is true perhaps that new textile mills to maintain the present output, can be financed without great difficulty from the reserve funds of the textile industry, (amounting to Yen 213,000,000) but this would withdraw from the banks capital required for other much needed purposes and impair the competitive position of the industry. So without outside financial assistance, Japan will find herself very hard pressed within the next decade to work out her problems along pacific lines, especially if she meekly accepts all the so-called humanitarian rules and regulations for the employment of labor that misguided altruists and highly paid American workers are constantly trying to enforce on all other countries with a complete and happy disregard for their peculiar conditions.

Peace in the Pacific Depends upon a Solution of Japan's Problems

So the interests of humanity, the sacred cause of civilization, the peace of the Pacific, expansion of trade and world prosperity, would be greatly advanced if some serious attention is given at this time to Japan's problems. Peace in the Pacific can be assured only by finding a suitable outlet for Japan's surplus millions. The pressure is now held under control by a government desirous of contributing its share to the pacific and amicable solution of world problems but any day may bring into power another element holding other ideas as to the proper method of seeking relief. The whirligig of Japanese politics may waft into power a leader who, following the precedent set by Mussolini, will tell the world plainly what Japan will do to find an outlet for its people.

Japan does not talk much, but if the time ever comes when frankness is necessary to a proper consideration of Japan's position, we make bold to predict that her claims will be given weighty consideration. *Manchuria and Mongolia may provide an outlet for Japan, but if this can be attained only by a war of aggression upon China, it may be taken for settled that Japan will not purchase this relief by sacrificing the friendship of a people they now recognize is essential to their future prosperity and happiness.* If therefore, the peaceful solution of world problems are the principal objects of the League, it behoves the guardians of the sacred cause of civilization sitting at Geneva, to carry out the high purposes of their mission by transferring the mandate of New Guinea to a people who will lose no time in colonizing and developing its resources for the benefit of humanity.

Or, if this is too strong medicine to swallow at one dose, and the American people are able to visualize their own great opportunity in the Pacific, they can with much greater profit, invest their surplus wealth in co-operation with a people doomed to stay at home and work hard in order to exist, and with them and through them dominate the trade of Asia. Here lies the opportunity of a thousand years.

Japan's New Positive State Policy

The Adverse Trade Balance to be Decreased by Stimulation Production: More Work for The People: The Development of Foreign Trade: Not Going where Not Wanted: Japan's Economic Isolation a Factor in World Politics

By George Bronson Rea

GOD helps those who help themselves. Japan is fully alive to the truth and force of this adage and with the heavy odds against her is bravely facing her difficulties with a determination to win out. While she would heartily welcome American financial co-operation in building up certain industries and strengthening her competitive position, her practical business leaders are not losing any sleep over this possibility, but have convinced themselves that by pulling together they have the means at home to surmount their difficulties and work out their problem unaided. It may take longer and involve greater hardships and possible political dangers but they have an abiding faith in the loyalty and good-sense of the working masses to co-operate patriotically for the good of the nation. The government is also keenly alive to the urgent necessity of assisting by every legitimate means within its power the expansion of its export trade and the protection of home industries to meet domestic requirements.

A new state policy has been inaugurated which it is hoped will materially decrease the present adverse trade balance by augmenting production of basic industries and at the same time facilitate exports. This may require state aid in the form of higher tariff protection, tax exemptions or subventions in some form or other, and the government is prepared to do everything within its power to contribute its share towards providing work for a people barred by other countries from finding relief by emigration. A positive program for the encouragement of industry has been approved covering state aid for steel, dyes, soda-ash, shipbuilding, woollen goods, automobiles, aluminum, fertilizer and machinery manufacturing as well as silk and silk products.

Radical Reform in the Export Trade

It is hoped that through tax exemption and other aids to industry, the cost of production can be lowered sufficiently to cut down the volume of imports and at the same time enable Japanese manufacturers to successfully compete in certain lines in outside markets. Any analysis of Japan's economic position will reveal that her fundamental weakness lies in her competitive export position, a condition which can be improved only by radical reforms in her whole industrial system and raising the efficiency of her labor. The difficulties surrounding any rapid improvement along these lines has convinced the government that until industrial efficiency is raised the competitive position of the country in world markets must be maintained as far as possible by official assistance. Although it may take some years perhaps to raise the standards of industrial efficiency, it is believed that the inherent enterprise and energy of the Japanese people put to the supreme test, will triumph over all difficulties. Occasional set-backs and disappointments may intervene to retard progress, but nothing can stop the assured march towards prosperity of eighty million hard-working people determined within themselves to survive in the modern industrial struggle for existence and economic independence.

Expansion or relief through an appeal to force being out of the question Japan will utilize every legitimate weapon of peace to find a solution to her problem. Intense trade rivalries for the control of foreign markets must necessarily follow as Japan fortifies her position with the industrial weapons required to safeguard her existence, and as these trade rivalries have in the past paved the way for armed conflicts, the people of other countries should study carefully the irresistible forces driving Japan forward in her struggle to exist. Egypt's insolent discrimination against Japanese tobacco; India's violent agitation for the immediate imposition of discriminatory duties that would wipe out her growing textile trade with that country; the high tariff in America which practically ruined the profitable soya bean and oil industry of Manchuria, are only the opening shots in an industrial struggle that spells defeat

to Japan's aspirations. Japan must and will take desperate steps to protect herself and if these measures involve an increasing amount of state protection and encouragement to industry, the underlying motivation for such legislation should be clearly understood by all other nations in order to eradicate ill-feelings that may ultimately crystallize into hatreds and war.

Japan's Isolation

The world has erected a ringed fence around the Japanese people from which they can escape only by an appeal to arms. Penned up within the narrow confines of their Island Empire, their peaceful existence can be assured only by hard work and the opportunity of selling the products of their toil to other more fortunate countries. In the absence of any great natural resources and the restricted farming area for raising the crops required to feed her steadily mounting millions, Japan's only asset is her human equation, the labor of her people. To utilize this asset to the full, Japan must have unrestricted access to nearby sources of raw materials and food and be conceded an equal opportunity to compete with her manufactured products in the markets of the world. If discriminatory tariff laws are enacted which close the door to this right to equal opportunity, then short of an appeal to force, Japan is justified in applying every other remedy deemed proper by her authorities in order to defend the rights of the Japanese people to exist. This truth must be driven home to the peoples of other nations while there is yet time for them to understand it, for Japan is now entering upon a phase of her struggle where her government will be called upon more and more to extend official support and encouragement to its export activities.

The first steps in this forward program have been taken. This last month has witnessed the gathering at Tokyo of all the Japanese consuls assigned to posts which come under the general designation of the "South Seas," a term applied to every country in Asia and Oceania south of Hongkong and around to India. The questions discussed were purely commercial and economic and ways and means by which Japan can utilize existing trade opportunities to expand her commerce. No political considerations entered into the discussions and although the agenda did not include the question of emigration; yet to a certain extent this had to be considered in connection with any program for trade expansion wherever the laws of other countries welcomed the entrance of Japanese settlers and merchants.

Not Going Where Not Wanted

The policy of the Japanese Government on this point was fully outlined by Baron Shidehara in his opening address when he declared that Japan must scrupulously refrain from action calculated to encourage emigration to any country where Japanese were not wanted. Not alone through the encouragement of her export trade does Japan expect to succeed, but as Baron Shidehara pointed out, the South Seas and India had not been sufficiently exploited commercially and their geographic propinquity offered excellent opportunities for the supply of raw materials upon which Japan could draw for her vital necessities. The cultivation of rice, sugar, hemp, rubber and other similar commodities provided a profitable outlet for Japanese capital and enterprise if conceded equal opportunity.

These near-by lands inhabited by peoples who hold no racial prejudices against other Asiatics, appeal strongly to the imagination of the Japanese. Brazil, and South America present glittering inducements to the Japanese emigrant and although his compatriots in Brazil now own land to the value of Yen 50,000,000 in the State of Sao Paulo alone, and huge grants of arable tracts await Japanese colonization and development along the upper reaches of the

Amazon, it is a long, long way from the Ginza. If he must emigrate and the doors of the White dominions in the Pacific are closed to his entrance, he would prefer to seek his fortune in lands nearer home where his commercial adaptability and closer connection with his own people will enable him to compete on more favorable terms for the trade of these countries. In all of the South Sea Islands and throughout Malaya, the Chinese merchant monopolizes the retail trade. He controls mines, sugar, rubber and other profitable plantations and industries and the Japanese feel that given equal opportunity they can through superior organization also find a profitable outlet for their investments and energies, and at the same time control enough basic raw materials to meet the requirements of their own country.

The Program of Development

As an outcome to the South Seas Trade Conference, the Diet will be asked at its next session to appropriate the necessary funds to carry out its recommendations. These will provide for substantial government aid to carry out the following objects:—

1. *Organization of a colonization company.*
2. *Creation of a purchasing and selling organization.*
3. *Appointment of engineering and technical advisers in addition to an increase in the number of commercial attachés.*
4. *Establishment of commercial museums at important trade centers and increased participation by Japan in the annual international fairs and exhibitions held throughout the "South Seas."*
5. *Creation of and financial aid to export guild or unions with the ultimate purpose of organizing them into a National Export Federation along the lines of similar organizations in America.*
6. *Insurance against export losses and bad debts patterned on the British scheme.*
7. *Government supervision over exports to prevent unfair competition arising from the improper use of trade marks or falsification of the country of origin or other practices violating international law.*
8. *Revision of the present system of double income taxation.*
9. *Government assistance in maintaining existing freight rates and traffic agreements, especially the India-Japan agreement and Japanese support to Japanese shipping and insurance companies.*
10. *Increased financial facilities for Japanese enterprises abroad either through existing banks or other means to be determined upon.*
11. *Unification under one department of governmental control over foreign trade.*
12. *Increase of consular officials in strategic commercial centers and appointment of extra vice-consuls as trade and commercial experts.*
13. *Government offices representing trade and commerce to be established at Osaka, the center of industrial activity.*
14. *Intelligent advertising of Japanese products.*

The conference is therefore a plain announcement of a radical change in Japanese diplomacy from a negative to a forward policy. A new epoch has been opened up by Baron Shidehara who realizes just how far Japan can go without provoking opposition. That the above program will invite criticism in some quarters goes without saying, but after all, Japan is simply following rather tardily in the footsteps of other successful trading nations in order to save herself from going under.

The Near East

Hand in hand with this program are other equally important and significant steps which announce to the world that Japan is determined to promote her legitimate trade interests wherever there exists an opening. Officials of the Foreign, Commerce and Communications Offices have held economic conferences at Constantinople attended by representatives of Turkey, Egypt and Persia. Treaties of commerce and navigation are being negotiated between Japan, Egypt and Persia while plans are being made for the extension of the Nippon Yusen Kaisha European service from Port Said to Near Eastern and Black Sea ports. The Yokohama Specie Bank has opened a branch at Alexandria and is carefully studying the possibilities at Mombasa. The Osaka Shosen Kaisha

has started a new direct service between Japan and East African ports where the exports of Japanese textiles are increasing despite tremendous competition from Lancashire. Persia offers an exceptional field for the extension of Japan's textile trade and a special diplomatic representative of that country is now in Tokyo to bring about closer trade relations. The Toyo Menkwa Kaisha has purchased a cotton mill in Bombay and there is every reason to believe that the same success will attend Japanese enterprise and management in India as has characterized its entrance into the Chinese field.

The spirit behind Japanese trade expansion in these countries is not a selfish one of exploitation for her manufactured products, as wherever it is possible Japan buys more than she sells. The Indian cotton grower sells 27 to 30 per cent, of his entire crop to Japan and the Indian pig iron mills rely on Japan as their chief market. Japan supplies Egypt with a quarter of her imported cotton goods, all of the cheaper quality, valued at £412,948, but she purchases 40,000 bales of her high grade cotton and as more of her mills are equipped with the special machinery for spinning Egyptian cotton, her purchases in this direction will increase accordingly. The spirit behind the Japanese program is one of give and take, live and let live, and in those countries like India where her purchases are vital to the prosperity of the farmer, it will be extremely dangerous to impose discriminatory duties to shut out her manufactured goods.

Friendship for China

In China, the promotion of Sino-Japanese amity and economic co-operation is steadily progressing under plans laid down last April by Baron Shibusawa when the Chinese Business Mission visited Japan. The Chinese members of the mission have presented the plan to the guilds and business organizations in Shanghai, Hankow, Canton, Hongkong, Tientsin, Wuchang, Nanking, Changsha, Ichang, Mukden, Harbin and Peking and obtained pledges of support. Arrangements, delayed by the war in the Yangtze region, have been made for the formation of a joint commission under the leadership of the former chairman of the Shanghai Chamber of Commerce, to carry out the objects of the association.

A most important development in the relations between China and Japan will arise this month when the existing commercial treaty between the two countries expires on the 19th. It is reported that Japan will propose the conclusion of a reciprocity treaty to take its place and settle during the negotiations the outstanding customs tariff differences, discussion of which was suspended by the civil war in China. Although there exist several difficulties in the way of a reciprocal trade treaty between the two countries, there is every reason to believe that some mutually beneficial and co-operative understanding will be arrived at.

Mitsui take the Lead

In commemoration of its 50th anniversary, the Mitsui Bussan Kaisha, the premier trading concern of Japan (and upon whose activities depends to a large extent the furtherance of the national trade expansion program) has organized a special society capitalized at Yen 1,000,000 for the purpose of encouraging in a practical way such enterprises as are considered useful for the promotion of the country's export trade. This society will supplement and strengthen the official program with the vast resources of the worldwide Mitsui organization. Another indication of the forward program of the government is seen in the announcement that the Finance Minister has lifted the ban on the importation of foreign capital in line with the policy of the government to bring about a reduction in money rates in Japan.

These and other significant activities announce that the government program for the peaceful solution of its economic problem is concentrated upon industrialization and the expansion of export markets through the application of every legitimate political measure that will assure success. The constant import tariff tinkering and increases to protect basic industries will undoubtedly call forth bitter criticism from those foreign interests benefitting from Japan's inefficient industrial methods, and as every new layer of bricks is laid to heighten the tariff wall, the chorus of protests will swell louder and louder. No matter what Japan may do along these lines, her government will be roundly scored by advocates of free-trade and those special organs for the defense of these principles

which exist in Japan to maintain her in industrial vassalage to other countries.

The Trade Balance

On the other hand, Japan faces a constant and chronic adverse trade balance that cannot be always settled by drawing on the overseas or national specie reserve, without reaching the point where the Bank of Japan's special gold reserve to cover the outstanding convertible note issue, will be endangered. Invisible imports of wealth from the net income from foreign investments, shipping and insurance services, tourists and other sources, amounting to a little over two hundred million yen, materially help to reduce the unfavorable balance, but notwithstanding, the tendency is slowly to eat into the specie reserve in order to settle the exchange.

Outwardly this situation appears somewhat depressing, but there is every evidence that entirely too much attention is devoted by the Japanese press to the excess of imports over exports as the barometer of national prosperity. It is too generally assumed that this excess is due to the growing extravagance of the consuming public in purchasing foreign-made luxuries and articles, when examination of the trade returns will disclose that the excess is caused by the marked increase in the importation of food products, fertilizers, raw materials and partly manufactured articles. Fully manufactured articles represent only about one fifth of the total volume of imports. Increased production in Japanese mills calls for an increased volume of raw materials, nearly all of which has to be imported, so the adverse trade balance is no indication in itself that Japan is headed towards economic ruin. As a matter of fact, prosperity to a large degree has already come to the people

of Japan and they will not surrender lightly the advantages in wages and consuming capacity they now enjoy as the result of conditions created during the war. Other nations may readjust their industries, pocket their losses and start afresh in the fight, but no one has had the courage to face the working masses of Japan with a similar proposition. Perhaps it is for the best, as through the enjoyment of high wages, even when altogether incompatible with their earning power, the Japanese people are enabled to consume more and thus maintain their home industries in a high state of productivity. There are few idle hands in Japan. The mills are working, reconstruction proceeds apace and the volume of national savings as shown in the bank returns are on the increase. The bogey of hard times, as pointed out recently by the *Osaka Mainichi* and by Mr. R. Ichinomiya, vice president of the Yokohama Specie Bank, are illusions not justified by the facts and constant harping on the unfavorable trade balance as a sign of national depression is mesmerizing the business world into a cowardly psychology towards trade.

All that the Japanese need is a stiffening of the backbone and courage to face the fight for their economic existence in the same indomitable spirit that won for them their political position in the world. Japan's battle for the right to exist can be won only by preserving the same grim discipline, loyalty and devotion to duty through all ranks and classes of society that characterized their victories in the more spectacular wars to preserve their political independence. Japan has the Leaders. If her people stick together, there is only one outcome to the great fight that is now being staged for the peaceful deliverance of an ostracized people from the fate the Western world has imposed upon them.

Uplift or Trade America's New Attitude

By George Bronson Rea

THE number of letters received by the Editor of "THE FAR EASTERN REVIEW," some in protest but the majority in support of the views expressed in the article entitled "Uplift or Trade" published in the June Number of this magazine, is convincing evidence that the time has arrived when a new turn must be given to our foreign policy in countries like Turkey and China where our trade interests have become subordinated to the furtherance of religious and educational work. The effect of this monopoly of diplomatic support extended to our uplift institutions is clearly seen in our present attitude towards China where our commercial position and rights under the treaties are being side-tracked in order to preserve the interests of our major industry in this country. This policy probably reached the peak of inconsistency when President Wilson refused to declare war upon Turkey in order to preserve the good-will of the Turks and protect our educational enterprises in that country. There may have been other excellent and sufficiently strong surface reasons to justify such a departure from all the recognized rules of warfare, but the thought remains that Wilson was more concerned over American missionary and educational work in Turkey than in meting out punishment to an enemy people whose favorite recreation for centuries has been the massacre of helpless Christians.

The right to proselyte in "Heathen Lands" deserves every legal support from our Government but when these activities become so important and formidable through the investment of millions in uplift institutions, whose value far exceeds the combined commercial and industrial properties in the same country and overshadows our trading position, it is time to give pause and study carefully the consequences. It may be that the surrender of our treaty rights in order to safeguard and advance the cause of Christianity and Education will in the long run bring us increased prestige and trade advantages as the result of the mercantile good-will of the Chinese, but long experience in China tells us that the good-will of the Chinese can be attained only through the

investment of American capital in developing their resources and industries.

That these thoughts have provoked a revulsion of opinion in the United States is evidenced by the evolution of a new diplomatic policy forced on our government by Catholic organizations urging intervention in Mexico in support of the Church and religious bodies. The time had to arrive when our Government would be forced to a show-down by the Catholics demanding support to their faith and institutions in foreign fields. The show-down has come in Mexico, and as a consequence the American Government has been compelled to formulate a definite policy as to the amount of support it can safely extend to religious institutions in foreign countries.

Commenting on this new orientation of our foreign policy, a Washington news article in the American papers says that for generations the Protestant missions in Turkey, China and elsewhere have been enjoying the moral support and at times the active backing of the Department of State and the Ambassadors and Ministers of the American Government. This has been mostly exerted where American schools or colleges and religious institutions have needed physical protection, but the diplomatic influence has been present, so that a degree of tolerance has been possessed by American missions which has not always been granted to those of other nationalities.

The question now is whether a precedent of tremendous importance to the future has been laid down in the policy adopted by the Department of State with reference to the Catholics in Mexico. There have been many advocates of a strictly "hands off" policy on the ground that the American Government should not interest itself in religious quarrels abroad. This advice has been heeded to the point of withholding any formal protest, but it is not yet clear how far an implied interest or concern shall be impressed upon the Mexican Authorities as coming from the American Government.

In Turkey the United States Government asked for definite assurances with respect to the continuance of the Protestant missions before the Lausanne treaty was signed. Indeed, some of the strongest supporters of the pact, which has yet to be ratified by the Senate, are the Protestant missionaries. But it is pointed out that in Turkey the American Government limited itself to concern over American citizens and their schools and missions. In Mexico the situation is somewhat different, because most of the priests who are affected by the new laws are Europeans. The American Government has found itself in an embarrassing situation, however, because under the implications of the Monroe doctrine representatives are usually made to any government in this hemisphere on behalf of the nationals of European governments.

The very fact that the Washington authorities felt circumscribed in the Mexican dispute to withhold the full measure of its diplomatic influence is being construed now as likely to the repeated if similar situations should arise in Turkey. In fact, it is openly suggested that if Turkish law should suddenly be changed so as to make it impossible for the missions to function, the Department of State would be bound by the precedent it has adopted in Mexico,

namely to express itself in only the most discreet and indirect fashion without using a full and formal protest.

Some of the Protestant missions abroad realize that their life depends solely on the good will of the governments which now permit them to function and that if these governments indicated an unwillingness to have them they might have to abandon their work in certain fields. In other words, the day of insisting on religious tolerance and the legal right to proselyte in foreign fields is passing, and this is illustrated to no small extent in the new attitude assumed by the Coolidge Administration.

The theory behind the policy is that in the long run such a policy, while a reversal of the policy of the Democratic Administration of President Wilson and Secretary Bryan, will lead to less entanglement abroad and that it is better for the American Government to be cautious and do nothing that might provoke new disputes or revive old controversies.

It is apparent that there is no question of religious discrimination involved for the present administration is certain to apply the same policy with respect to both Protestants and Catholics in foreign countries.

A Japanese Flour Trust

HNEWS despatch from the Vancouver Correspondent of *The Times* says that news has been received in that city that this summer will see the first large grain elevators built in the Far East. One is to be built at Shanghai and the other at Yokohama or Kobe. For some time firms in the Far East have been gathering data from Canadian engineers, elevator companies, and operators.

It is understood that final arrangements are being made with Canadian contractors for the erection of a 1,000,000 bushel plant at Shanghai, which will be owned and worked by one of the largest English firms operating in the Orient. This elevator will supply more than a dozen flour mills in China. Messrs. Mitsui and Company, who have shipped a large quantity of Canadian wheat to Japan this year, will build the projected elevator in Japan.

Vancouver grain dealers are watching the development of the Oriental trade with great interest. The demand for grain in China and Japan has grown considerably, and further important developments are anticipated as soon as proper handling facilities are provided.

At present both sack and bulk grain is shipped to the Orient, but the unloading of bulk grain into lighters is a slow and costly process, which will be eliminated by the erection of elevators.

This development coupled with the announcement of the merger of the two largest Japanese flour milling companies into a formidable trust, is only another proof that modern methods of efficiency are fast displacing the old slipshod methods of doing business. The facts contained in the Vancouver dispatch would seem to foreshadow a coming struggle between Japanese and British interests for the control of the Chinese flour trade in which the Japanese mills through amalgamation and lowering of manufacturing costs hope to underbid the independent Chinese flour millers.

The announcement of the merger of the Nippon Flour Mill Company with the Nissin Flour interests startled even their Japanese competitors so secret had the negotiations been kept.

According to the announcement, the Nippon interests are to increase their capitalization, prior to the merger, from Yen 12,300,000 to Yen 25,340,000 and the new shares, totaling 260,800 valued at Yen 13,040,000, are to be accepted by shareholders of the Nippon interests at the ratio of Nippon shares to one new share and also by those of the Nissin interests at the ratio of two Nissin shares to one new share. The remaining new shares, numbering 14,500, are to be disposed of by the directors of the Nippon organization.

The capitalization of the Nissin Flour Mill is Yen 12,330,000 and it is to be increased to Yen 25,000,000. The Nissin interests dissolve legally and the new company is to be named the Nippon

Seifun Kaisha (Japan Flour Mill Company, Limited). These two companies are the largest flour mills in Japan. The producing capacity of the Nissin Mill is 13,000 barrels daily, and that of the Nippon Mill 19,500 barrels. They furnish 80 per cent. of the entire production of Japan.

That the possibilities of such a trust in supplying the growing demand for wheat flour throughout the Orient are not ignored in the United States is evidenced by an article in the current issue of the National Bank of Commerce, which says:—"Stimulated by conditions arising out of the war the milling industry of Japan was expanded and a profitable export trade in flour maintained for a short time. With the exception of this period, Japan had been until last season a net importer of flour as well as wheat. During the years following the war, exports of flour fell to a low figure, but through varying vicissitudes of trade, the Japanese milling industry has gradually expanded until by the beginning of 1926 it had an estimated daily capacity of 37,920 barrels, sufficient to take care of considerably more than the average amount of wheat consumed in the country. The pressure for an export market in addition to the domestic one is evident.

"That the Japanese mills are feeling the pressure of competition among themselves is evidenced by their recent agreement for a drastic limitation of output for two years. As this limitation does not apply to the export trade, however, each mill being allowed an increase in output to balance any previous increase in exports, it is likely to intensify competition for external flour markets.

"The fundamental weakness of the Japanese situation lies in the dependence of the mills upon imported wheat to supply their export flour trade, and the necessity of maintaining this export trade if the mills are to keep up a profitable rate of operation. While mills elsewhere have frequently succeeded in surviving excess capacity and while several countries of Europe successfully maintain an export flour trade based upon imported wheat, the continued success of the Japanese industry can not be argued from these facts alone.

"With the Japanese flour market already well supplied by domestic mills. China has become the arena of competition for the flour trade of the Orient. Despite the goodly number of modern mills at Shanghai, the principal milling center of the country, the industry as a whole is far from the stage of development which has been reached in Japan. Contrary to the situation in that country, Chinese mills depend mainly upon home-grown wheat and imports are largely in the form of flour.

"All the evidence of a growing taste for wheat products in the Orient should not be allowed to engender too much optimism as to the absorptive capacity of that purchasing power would greatly extend possibilities for the marketing of flour. Nevertheless, it is unlikely that rice, a cheap, home-grown cereal, will be largely

replaced by wheat in Oriental diet, and imports of wheat may be expected to continue to fluctuate according to the varying fortunes of the rice crop. The habits of the masses of the population in the interior change slowly and the addition of wheat products to the diet will doubtless prove to be a slow and somewhat erratic process.

"Whether the future demand will be for flour or for wheat from abroad will depend upon the success of Japanese mills in

establishing their position and upon whether a milling industry can be built up in China large enough to take care of imported wheat. In appraising the milling industry of the Orient, however, it must be remembered that cheap labor is of relatively small advantage to modern milling because of the automatic nature of most of the operations and that a low capital charge is a correspondingly important consideration."

Oh Where, Oh Where is the Consortium?

A French Breach of the Consortium Agreement

More Money to a Bankrupt, Unrecognized Chinese Government

THE Chinese are ever-lastingly complaining that they cannot settle their own affairs because foreign Powers are constantly lending money to political factions in the country. Ever since the Reorganization and Crisps Loans, the various military factions have been able to borrow abroad whenever they found it possible to control Peking for a short time and thereby to get themselves recognized by the Powers as a legally constituted Government. The object of the Consortium was to bring an end to such a situation, but the Consortium has not been able to do more than to stop irresponsible nationals of various countries from subsidizing military and political factions of China. Now comes France, a signatory to the Consortium agreement and breaks the agreement. The French Minister in Peking actually witnesses this breach of good faith. The French Government apparently approves of letting down Great Britain, the United States and Japan in China.

Mr. Rodney Gilbert gives a full account of the transaction in the *North-China Daily News*, which we herewith republish. It is up to the French to square themselves before their allies and associates :

Peking September 7.—It has been reported here for some days that a syndicate of French engineering firms had signed a preliminary contract with the local Fengtien authorities for the construction of the long talked of Tsangchow-Shihchiachung Railway, connecting the Kin-Han and Tsin-Pu railways and also serving as an extension of the Taiyuanfu line in the direction of Tientsin and the coast. It seems such as unpropitious time for such an undertaking, with all railways in military hands and no Central Government in Peking that can possibly endorse such a deal with any pretence at legality, that few of the persons who are usually interested in such matters have bothered to confirm the report, assuming that it was one of those abortive schemes that must of necessity perish in embryo.

Whether worth recording or not, it is true that such a bargain has been signed. M. Marchand, formerly superintendent of motive power on the Kin-Han line, has acted as the representative of the Schneider-Creusot-Skoda syndicate in the negotiations.

The preliminary agreement, as witnessed by the French Minister, the Comte de Martel, is almost identical with that signed by a British firm in 1922 and rejected by the Consortium.

It provides for an advance of \$3,000,000 within three months of the signing of the preliminary contract and for a total loan of \$15,000,000. Foreign supervision is, as usual, guaranteed by the appointment of foreign engineers, auditors, etc. The contracting firms are given the preference in the purchase of supplies during the construction and equipment of the line. The railway and its earn-

ings are as usual the security. In all essentials the contract reproduces the terms of the Lung-Hai agreement.

It will be remembered that the earth embankments for the line, which traverses very flat country, were built with famine labor in 1920. Construction would, however, entail the erection of a half-dozen large steel bridges over river beds that are frequently in flood. With political conditions in China normal and the military on their good behaviour, the Tsangchow line should be a handsome investment because it not only taps much rich country but would bring Taiyuanfu and Shihchiachung about 70 miles nearer to Tientsin. The transport of Honan and Shansi coal alone would warrant its construction.

That anyone should dream of building a railway at this juncture in China and of presenting an unrecognized régime with \$3,000,000 to seal a railway contract, is entirely beyond the understanding of bankers and railway experts in Peking. They see in it nothing but an added convenience for military joy-riders and the opening of another bit of China to looting, devastating armies. Unless France seriously contemplates intervention in the near future or is persuaded that some one else does, it is difficult to understand how the French Government can sanction the investment of French capital in such a forlorn hope as a Chinese railway. Why buy Tsangchow-Shihchiachung bonds—stock in a hypothetical railway that cannot be completed for several years—at par when you can get Lung-Hai bonds for 20 ? If the French Government wants its investors to control a railway in China, there are four or five in as full operating order as the militarists will allow, reaching highly developed markets, which can be had at a third of cost.

One wonders also how the construction of this line is to be financed, M. Marchand's syndicate is undoubtedly rich and powerful, but it has shareholders who would scarcely rejoice to see \$15,000,000 sunk in a Chinese railway after consulting any published list of Chinese railway quotations in London or Paris. If the leading French banks are approached with the suggestion that they should sponsor a railway bond issue, they must offer the project to the Consortium, which would instantly tread upon the project with obliterating weight. A minor French banking group, ignorant of conditions in China, might attempt to finance construction, but it would have only to put the bonds on the market to learn a lot of painful things about China's credit if the French Government did not anticipate such a step with a little devastating information about the present condition of foreign built railways in China.

These considerations occur to everyone in Peking who has the slightest knowledge of railway finance and rob the French undertaking of all speculative interest.

Japanese Machinery in China

JAPANESE newspapers have become so accustomed to thinking in terms of cotton yarn and textiles as the chief export of their country that when a slight business depression sets in as the result of a slump in foreign orders they immediately set up a wail that the nation is facing disaster. To a large extent they are justified in this, but at the same time they altogether

ignore that these near-by Asiatic markets are capable of enormous expansion for other of their manufactured products, if they go after the business in the same manner as they have developed their home markets. Few Japanese manufacturers seem to be aware of the strides they have made in supplying the machinery requirements of the Far East. They now occupy third place in the China market,

dividing the business about equally with Great Britain, America and Germany. Japan has increased her machinery exports to China ninefold since 1913, and the returns for the present year, which will include the steel rolling stock made for the Manchurian railways will still further increase her proportion of the business.

If the Japanese machinery manufacturer should adopt American and British methods of publicity and advertise his specialties in the proper manner, he would soon become a formidable rival for the Chinese engineering trade. Aside from a very few of the more important concerns who realize the benefits of publicity, the Japanese seem to be afraid to let the rest of the world know what they are doing. They do good work and do it well, in many cases as well as it can be done in England or America, and many of their specialties are produced so cheaply as to particularly fit them for the low priced Chinese market.

The growing participation of Japan in supplying China's textile machinery requirements is a natural consequence of her large investments in Chinese mills and loans to purely Chinese textile concerns. A recent visit to ten of the largest textile mills in Japan revealed that the installation of Japanese-made machinery is increasing rapidly and although the efficiency of such machines might be questioned by foreign experts, they fill the requirements and meet with the full approval of the Japanese engineer. Japanese textile machinery will gradually displace all other makes in China and open up a new outlet for their activities.

The United States Commerce Reports on the machinery imports into China emphasize the present position of Japan and tell us that it will not be many years before their engineering products will attain first place in the imports of that country.

The total imports of industrial machinery into China during the year 1924 (the latest for which statistics are available) amounted to \$18,672,000, as compared with \$21,904,000 and \$41,387,000 for the years 1923 and 1922, respectively. The 1924 machinery import trade represents four times the average value for the pre-war years 1910 to 1913, inclusive, which amounted to only \$4,604,080. In view of the political disturbances which China has been experiencing, this showing is a tribute to the remarkable trade vitality of that country, and argues well for renewed activity when conditions become more favorable. This trade expansion is also indicative of the growing industrialization of China, which is taking place in common with other Asiatic countries.

A study of the participation of the machinery producing countries of the world for a share of the Chinese trade reveals some very significant developments. In 1924 Great Britain, the principal supplier to this market shipped to China industrial machinery valued at \$5,519,384, followed by the United States and Canada with a total of \$3,859,731, Japan with \$3,520,916, and Germany with \$3,179,075. The pre-war situation, as revealed by average for the four years 1910 to 1913, inclusive, were as follows: Great Britain, \$1,730,050; Germany, \$847,736; Japan, \$409,224; and

the United States and Canada, \$331,620. In comparison with this pre-war period shipments from both Great Britain and Germany have increased more than threefold, those from Japan nearly ninefold, while those from the United States have risen almost twelvefold, or more than the shipments of any other competing country.

The standing of the principal suppliers to this market prior to the World War, as indicated by the average percentages shared during the years 1910 to 1913, inclusive, was as follows: Great Britain, 37.9 per cent.; Germany, 18.3 per cent.; Japan, 8.9 per cent.; and the United States, 6.8 per cent. The relative participation in the trade of 1923 gives the following order: Great Britain, 29.6; United States and Canada, 20.7 per cent.; Japan, 18.8 per cent.; and Germany 17 per cent.

The industrial machinery imports of China are becoming more largely controlled by Great Britain, the United States, Japan, and Germany, and less widely distributed among other nationals. The percentages shared by "all other countries" in the years 1910 and 1911 were 26.8 per cent. and 29 per cent., respectively, and rose as high as 35 per cent. in 1912, whereas the portion so shared in 1924 amounted to only 13.9 per cent.

The United States and Japan both enjoyed a largely increased share of the Chinese machinery trade during the years of the World War, and their present participation, as indicated by an average for the years 1922 to 1924, inclusive, is almost identical. The fact that Germany has almost regained its average pre-war share of the Chinese imports is also significant.

Imports of textile machinery have been decreasing steadily from the unusual levels of the war and postwar boom periods, and in 1924 the total value of such imports, namely \$4,756,336, represented less than half of the total for 1923. Nevertheless the 1924 imports of this class of machinery represented more than 11 times the average value of the imports for the pre-war period of 1911 to 1913, inclusive, which amounted to only \$389,301.

The share of the United States and Canada in China's imports of textile machinery increased from approximately 8 per cent. in 1923 to 10 per cent. in 1924, whereas the share of Great Britain decreased from 50 per cent. to 45 per cent. The comparison becomes more striking when based upon pre-war years, for the American participation has increased from an average of only 1.6 per cent. for the years 1911 to 1913, inclusive, to 10 per cent. in 1924, but that of Great Britain has decreased from an average of 73 per cent. for the pre-war period to approximately 45 per cent. in 1924.

Of outstanding importance in the textile machinery market of China is the growing participation of Japan, which has increased from an average of only 14 per cent. for the pre-war period to 37 per cent. for each of the years 1923 and 1924, so that this country now ranks second only to Great Britain as a source for such equipment.

Traffic on the Japanese Government Railways in 1925

An Officer of the Passenger Traffic Section in the Railway Department at Tokyo Summarises Operation in 1925, indicating the Degree of Recovery Since the Earthquake of 1923

GHE year 1925 was the second year after the great earthquake and fire in 1923. Temporary reconstruction measures adopted just after the disaster made fairly good progress and were almost completed during the year. Consequently, the condition of railway traffic, which has a close connection with social activities, showed a little depression in 1925 both in passenger and freight traffic compared with 1924—during which the spirit of reconstruction was so intense that the passenger traffic was frequent and the movement of goods was unusually active.

From the latter part of 1923 to the early months of 1924 a great many Tokyo people, who had had their houses destroyed by the earthquake or the ensuing conflagration, moved out into the suburbs from the city. This daily passing of the people to and from the city caused a sudden increase in suburban traffic and occasioned great congestion on the lines around Tokyo. But this transient suburban population returned to the city month by month, as temporary houses were gradually built. This resulted in a slow decline in the passenger traffic. The freight traffic, which had shown

Month.	GOODS TRAFFIC.		Increase or	
	Tonnage.	Increase or Decrease* against 1924.	Revenue.	Decrease* against 1924.
			£	£
January ..	4,868,791	90,466*	13,999,748	548,029*
February ..	4,754,698	207,259*	13,836,919	1,104,830*
March ..	5,616,014	173,694*	16,580,860	761,127*
April ..	5,384,513	258,928*	15,858,852	993,046*
May ..	5,402,594	255,859*	15,700,030	963,711*
June ..	5,188,842	30,536*	15,258,308	227,974*
July ..	5,032,094	49,785*	14,740,917	81,447*
August ..	5,140,945	389,428	15,393,525	1,024,358
September ..	4,954,298	201,333*	15,492,588	397,170*
October ..	5,623,182	120,041	17,686,331	628,615
November ..	5,685,971	342,679	17,455,240	1,034,926
December ..	6,007,228	362,133	18,774,952	1,548,042
Total ..	63,659,170	53,579*	190,778,270	841,391*

*Decreases.

Month.	PASSENGER TRAFFIC.		Increase or	
	Number.	Increase or Decrease* against 1924.	Revenue.	Decrease* against 1924.
			£	£
January ..	49,873,805	1,135,286	21,151,867	312,239
February ..	38,893,319	2,682,935*	17,138,071	1,679,025*
March ..	48,718,298	2,251,338	22,856,997	584,859*
April ..	118,857,871	14,186,263	28,959,250	170,802
May ..	56,009,504	1,864,457	23,851,181	313,639*
June ..	43,351,749	508,531	18,641,181	525,606*
July ..	47,005,861	2,172,711	20,510,971	289,730
August ..	47,175,540	1,054,361	23,569,707	111,959*
September ..	55,206,504	3,996,868	20,418,576	388,731
October ..	57,075,728	4,403,755	24,184,675	1,081,142
November ..	49,653,375	5,369,591	20,802,295	672,767
December ..	47,592,760	5,147,369	20,436,701	720,417
Total ..	659,414,314	39,407,595	262,521,472	420,740

*Decreases

extreme activity in the transportation of general goods and of materials for building and repairing, gradually decreased. At the same time the economic depression in general and the Government's retrenchment policy in finance, and also the national current of thrift, naturally had a great effect upon the railway traffic.

Thus the abnormal activities of transportation of post-earthquake days gradually declined with the advance of reconstruction and the influence of hard times, the traffic condition in 1925 continuing dull and depressed from the very beginning of the year until the end of June. From July and August the condition was improved by degrees, as financial circles in general showed a tendency towards improvement. This increase counterbalanced the greater part of the decrease of the early half of the year, the revenue for the whole year showing a decrease of about Y.400,000 against 1924.

Goods Traffic

The most outstanding feature of the railway traffic in 1925 was a great decrease of goods transportation. Special goods, which were transported in enormous quantities in the previous year for building and repairing works in the area devastated by the earthquake, were not seen in this year. On the other hand, the unfavourable results of traffic were due to the retrenchment policy in all lines of business necessitated by the financial depression. Thus the decline in the movement of goods endorses the prevalence of the economic depression.

For these reasons the goods tonnage and revenue showed a decline from January to July as compared with previous year. As shown in the table, February had the largest decrease, amounting to Y.1,000,000, and July the smallest, viz., Y.80,000. In other months the returns showed a decrease varying from Y.230,000 to nearly Y.1,000,000. The decline in July was due to the suspension of traffic when the automatic couplings were being installed on the rolling-stock. From August a progressive increase in the goods revenue followed the progressively increasing goods business, which indicated an improvement in financial circles. It showed an increase of Y.1,000,000 in November and of Y.1,550,000 in December, as compared with the same period in the previous year. By the end of the year the greater part of the decrease in the first half of the year was counterbalanced by the prosperous business of the latter half of the year. The reason why the revenue is disproportionately small for the tonnage carried is that the goods rates for marine transportation fell because of the excess of shipping space, and the long-distance service which had hitherto been taken by the railways was replaced by marine transportation, the short-distance service alone being left to the railways.

Passenger Traffic

The decline of income of passenger traffic was no exception in the first half of the year, owing to the effects of the financial depression, which kept so many people from travelling. During this period of light traffic the railway authorities instituted reduced fares for several of the summer resorts. This brought a fairly good result. As with the goods traffic, the passenger traffic was prosperous in the latter half of the year except August only, during which we had heavy rain for about three weeks and the traffic was stopped on several lines. The number of passengers showed an increase in almost every month except in February. We had an increase of 13 per cent. in April, over 10 per cent. in November and December, and in other months about 5 per cent.

If we compare the number of passengers and amount of revenue with the figures for the preceding year, the revenue is not proportionate to the number of passengers. This is ascribable to the big increase of passengers in the suburban traffic, especially of passengers who use commutation tickets, and also to the institution of the reduced railway fares. Thus we had, as above explained, a fairly high increase in passenger traffic, but a decline in total revenue owing to the enormous decrease in goods transportation.

The Wireless Monopoly in China

THE Federal Wireless Company apparently sought to establish a wireless monopoly in China. Long, tedious and irksome negotiations between that company and the Chinese Government and the American Government and Japan and Great Britain over the wireless situation in China have led to nothing but international recriminations and hard feelings. All that has been accomplished by this effort to establish a monopoly has been that the Chinese, themselves, ignoring all agreements between their central government and any foreign Powers and following the adage that nature abhors a vacuum, are building stations all the time. Any idea of a monopoly must now be abandoned, as there are too many stations in China at the present time, for any one group to monopolize anything. Any idea of developing wireless in China by

international concert must also be abandoned. The American operations in this field have brought about nothing but a stoppage of the efforts of any other nation which was not following a dog-in-the-manger attitude.

Now comes that remarkable compendium of information, the *China Year Book*, for the year 1926, with a complete list of all stations, existant and planned in China. The list is somewhat too complete, for it contains stations in leased territories and foreign colonies in China, and some of the explanatory remarks may require investigation. But it is an excellent list, the only complete one we have seen and we are here reproducing it in its entirety that all men may see how an attempt at a monopoly in China has failed:

Wireless Stations in Operation or Under Construction in China.

City.	Province or Territory.	Ownership.	By whom Controlled.	Call signal	Normal Range in Nautical Miles Day Night		Approximate Antenna Power	System of Radio Telegraphy with the Characteristics of the System of Emission	Wave Length in Meters	Remarks
Harbin	Manchuria	Russian	Japanese Army	HB	600	1,400	15 K.W.	Telefunken Quenched	2,400	This station is in a very poor state of repair and only used for receiving messages.
Manchouli	Manchuria	Japanese	Japanese Army	RLH	400	1,200	10 K.W.	Teishinsho Musical Spark	300, 600, 1,800	This station should be dismantled with evacuation of Japanese Troops from Siberia; every indication that Japanese consider it a permanent station.
Kungchuling	Manchuria	Japanese	Japanese Army	RLD	400	1,200	10 K.W.	Teishinsho Musical Spark	300, 600, 1,800	
Lungtsintsung	Manchuria	Japanese	Japanese Army	RLC	400	1,200	10 K.W.	Teishinsho Musical Spark	300, 600, 1,800	Dismantled.
Liaoyang	Manchuria	Japanese	Japanese Army	RLB	200	500	8 K.W.	Teishinsho Musical Spark	300, 600, 1,800	Portable set with permanent mast.
Hunchun	Manchuria	Japanese	Japanese Army	RLG	200	500	8 K.W.	Teishinsho Musical Spark	300, 600, 1,800	
Dairen	Manchuria (Kwantung Leased Territory)	Japanese	Japanese Army	JDA	400	1,200	10 K.W.	Teishinsho Musical Spark	300, 600, 1,800	Old station.
Dairen	Manchuria (Kwantung Leased Territory)	Japanese	Japanese Army		1,600	4,000	35 K.W.	Teishinsho Musical Spark	300, 600, 1,800	New station.
Port Arthur (Ryojun)	Manchuria (Kwantung Leased Territory)	Japanese	Japanese Army	JDB	200	500	8 K.W.	Torikada Spark (T.Y.C.)	300, 600, 1,800	Used by Japanese Navy and official business.
Chinwangtao	Chihli	Japanese	Japanese Army	RSW	400	1,200	10 K.W.	Teishinsho Musical Spark	300, 600, 1,800	New station with military wire to Tientsin, Peking and Mukden.
Urga	Mongolia	Chinese	Mongols and Bolsheviks	XRG	1,200	3,000	25 K.W.	Marconi Poulsen Arc	4,000, 6,000	Now worked by Soviet Authorities.
Kalgan	Chihli	Chinese	Ministry of Communications	XQL	600	1,300	5 K.W.	Telefunken Quenched	1,600, 2,100	Used for all purposes.
Peking (Japanese Legation)	Metropolitan District	Japanese	Japanese Army	RPN	1,000	2,000	15 K.W.	Teishinsho Slow Spark	300, 600, 1,800	Used for Japanese Legation.
Peking (Temple of Heaven)	Metropolitan District	Chinese	Ministry of Communications	XPK	800	1,600	5 K.W.	Vacuum Tube and Telefunken Quenched	1,600, 1,650, 2,100 2,650, 3,150	Used for all purposes.
Peking (United States Legation)	Metropolitan District	American Navy	American Navy	NPP	1,800	3,200	30 K.W.	Federal Poulsen Arc	3,000, 4,000, 5,000	American Military Purposes.
Peking (East Gate of City)	Metropolitan District	Chinese	Ministry of Communications							Receiving only: aerial consists of one wire one mile long. Station gets European news.
Tientsin	Chihli	Japanese	Japanese Army	RTS	200	500	8 K.W.	Teishinsho Musical Spark	300, 600, 1,800	Portable set with permanent Mast.
Chefoo	Shantung	Chinese	Ministry of Communications	XOF	600	1,300	5 K.W.	Telefunken Quenched	600, 1,200, 1,600	Completed January, 1922. Used for all purposes.
Tsingtao	Shantung	Chinese (Ex-German)	Ministry of Communications	XRT	1,000	2,000	12 K.W.	Teishinsho Musical Spark	600, 1,200, 3,000	
Shanghai (Chinese Telegraph Administration Building)	Kiangsu	Chinese	Ministry of Communications	XSH	80	200	3 K.W.	Telefunken Old System	600	Communication with Tsungming.

Wireless Stations in Operation or Under Construction in China.—(Continued).

City.	Province or Territory.	Ownership.	By whom Controlled.	Call signal	Normal Range in Nautical Miles Day Night	Approximate Antenna Power	System of Radio Telegraphy with the Characteristics of the System of Emission	Wave Length in Meters	Remarks
Shanghai (French Settlement)	Kiangsu	French	French Consul	FFZ	200 700	7 K.W.	Electric Musical Spark	600, 900	Extensively used for news service in receiving from Europe.
Shanghai (American Consul)	Kiangsu	American Navy	American Consul						Receiving only.
Shanghai (Woosung)	Kiangsu	Chinese	Ministry of Communications	XSG	800 1,600	5 K.W.	Vacuum Tube and Telefunken Quenched	1,600, 2,100	Used for all purposes.
Foochow	Fukien	Chinese	Ministry of Communications	XOW	600 1,300	5 K.W.	Telefunken Quenched	600, 1,200, 2,000	Used for all purposes.
Canton	Kwangtung	Chinese	Ministry of Communications	XNP	600 1,300	5 K.W.	Telefunken Quenched	1,600, 2,100	Used for all purposes.
Hongkong (Hongkong Island, Cape D'Aguilar)	English Crown Colony	British	British Army	VPS	150 400	5 K.W.	Marconi Arc	600, 1,800	
Hongkong (Stone cutters Island)	Kowloon Leased Territory	British	British Army	BXY	1,500 3,000	30 K.W.	Marconi Arc	3,000, 4,000, 5,000	
Kwangchow-wan	Kwangtung Leased Territory	French	French Army	FWA	150 400	5 K.W.	Musical Spark	600, 1,000	
Yunnan	Yunnan	French	French Army		100 300	3 K.W.	Musical Spark	600, 1,000	New 50 K.W. station to be completed in July, 1922 by Sino-French Company.
Kashgar	Sinkiang	Chinese	Ministry of Communications	XRK	1,200 1,300	25 K.W.	Arc	3,000, 5,000	Completed, July, 1922.
Urumehi	Sinkiang	Chinese	Ministry of Communications	XRM	1,200 1,300	25 K.W.	Arc	3,000, 5,000	Completed, June, 1923.
Tsungming	Kiangsu	Chinese	Ministry of Communications	XSU	300	15 K.W.	Telefunken Quenched	600	Communication with Shanghai.
Mukden	Manchuria	Chinese	Superintendent of Wireless Stations in Manchuria	XOM	3,000 6,000	10 K.W.	Vacuum Tube	3,000	Used for both sending and receiving.
Harbin	Manchuria	Chinese	Superintendent of Wireless Stations in Manchuria	XOH	1,500 3,000	5 K.W.	Vacuum Tube	2,500	Used for both sending and receiving.
Yinkow	Manchuria	Chinese	Superintendent of Wireless Stations in Manchuria	XOJ	300 600	1-5 K.W.	Telefunken Quenched Spark	600	Used for both sending and receiving.
Tsitsihar	Manchuria	Chinese	Superintendent of Wireless Stations in Manchuria	XOT		1 K.W.	Telefunken Quenched Spark		Used for both sending and receiving.
Changchun	Manchuria	Chinese	Superintendent of Wireless Stations in Manchuria	XOK		2 K.W.	Telefunken Quenched Spark		Used for both sending and receiving.
Paotow	Suiyuan	Chinese	Ministry of Communications	XOP	300 300	0.5 K.W.	Vacuum Tube	900	For all purposes.

Wireless Stations in Operation or Under Construction in China.—(Continued).

City.	Province or Territory.	Ownership.	By whom Controlled.	Call signal	Normal Range in Nautical Miles Day Night	Approximate Antenna Power	Wave Length in Meters	Remarks
Loyang	Honan	Chinese	Ministry of Communications.	XRY	600 1,300	5 K.W.	Telefunken Quenched Spark	1,200, 1,600 For all purposes.
Shwangchiao	Chihli	Japanese	Under the joint Control of China & Japan	XXZ	Communicates with Europe and America	500 K.W.	High Frequency Transmitter	7,500, 16,000 Sending and receiving both in experimental stage.
Yunnan	Yunnan	Chinese	Provincial Government of Yunnan	XQM		50 K.W.	High Frequency Transmitter	10,500 Used for both sending and receiving.
Tientsin	Chihli	Chinese	Ministry of Communications	XOL	300	0.5 K.W.	Vacuum Tube	750, 1,000 Used for both sending and receiving.
Tsinan	Shantung	Chinese	Ministry of Communications		1,000 2,000	12 K.W.	Teishinsho Musical Spark	300, 600, 1,800 Not yet opened.
Swatow	Kwangtung	Chinese	Commandant of Army of Kwangtung					No details.
Wuchang	Hupeh	Chinese	Ministry of Communications	XOC	600 1,300	5 K.W.	Telefunken Quenched Spark	600, 1,200, 1,600 Used for both sending and receiving.
Taku		Chihli	Ministry of Communications	XOQ	300	1.5 K.W.	Telefunken Quenched Spark	600, 1,200, 1,600 Ship Service.

Radio Stations to be Erected by Foreign Companies for the Chinese Government.

Radio Stations in China and Hongkong number 47 of which	City.	Province.	Company.	Approximate Power.
12 Are Japanese Controlled	... ... Harbin	Manchuria	The Federal Wireless Co. (American Co.)	200 K.W.
26 Are Chinese Controlled	... ... Shanghai	Kiangsu	The Federal Wireless Co. (American Co.)	1,000 K.W.
2 Are British Controlled	... ...		
3 Are French Controlled	... ... Shanghai	Kiangsu	The Federal Wireless Co. (American Co.)	60 K.W.
2 Are American Controlled	... ... Peking	Chihli	The Federal Wireless Co. (American Co.)	60 K.W.
1 Is Mongol and Bolshevik-Controlled	Canton	Kwangtung	The Federal Wireless Co. (American Co.)	60 K.W.
1 Joint Control of China and Japan	... Hankow	Hupeh	The Federal Wireless Co. (American Co.)	60 K.W.

Russia and Britain in China

"The chaotic conditions in China during the last few years have obscured the changes that have taken place in the old rivalry between the Russians and the British for power in the Far East. Prior to the Great War, the Russian Imperial Government sought to consolidate its political influence in North China without interfering with British commercial interests. In the background of Russia's China policy, however, was the hope of ultimately displacing British supremacy in Asia. Great Britain, confident in her great political and naval strength, was willing to confine herself to extending and consolidating her commercial hold in China, as long as Russia did not interfere with this by bringing political pressure to bear on China.

"The World War temporarily eclipsed Russia in China. She lost all her special privileges and concessions, including the Russian section of the foreign city at Tientsin. She also lost the rights of extra-territoriality throughout the republic. Great Britain's trade in the meantime increased largely, and her principal political concern was to see that Japan did not become too powerful on the Asiatic mainland. This policy, according to some of the British on the China coast, was rendered more difficult by the expiration of the Anglo-Japanese alliance with the signature of the Four-Power Treaty at the Washington Conference.

"Although in no country is the venture of prophecy so hazardous as in China, yet it may be stated that there are in China to-day two tendencies—first, the gradual weakening of British economic and political supremacy in China, and the concentration of Great Britain's interests west of Singapore; and second, the advance of Russia on Manchuria and North China, strangely parallel to what was taking place prior to the Russo-Japanese War. Both of these tendencies will be hastened or delayed by the development of the so-called Nationalist movement in China and by the activities of Japan on the Asiatic mainland.

"Russia still dreams of dominating North China and of ultimately being able to force the hated British out of Asia. Russia's rôle, therefore, is fundamentally an aggressive one. For Great Britain the great problem is to know how to hold what she already has."—Nicholas Roosevelt in *Foreign Affairs* (New York) for October.

International Foundry Trade Exposition in London

THE annual convention of the Institute of British Foundrymen was held recently in London in conjunction with the International Foundry Exposition. A number of papers were presented from America, France, and Belgium, and widely varied aspects of foundry work were discussed. The delegates paid visits to a number of important works in the neighborhood of London, and also made an inspection of the Metallurgical Department of the National Physical Laboratory of Great Britain.

The exposition served to show the great importance of the foundryman in modern industry. He was one of the earlier allies of the engineer—it is even asserted by some that he preceded the smith—and proof was given at the exposition of the remarkable fashion in which he has managed to keep his technical skill abreast of modern conditions. Sir Robert Hadfield, in opening the exposition, made reference to some recent achievements of the foundry trades. Besides the processes for dealing with metals of low melting points the foundryman has produced moulds for non-ferrous metals capable of withstanding temperatures up to 1,000 degrees Centigrade and made provision for temperatures of 1,200 to 1,300 degrees Centigrade for cast iron and up to 1,500 degrees Centigrade for cast steel. It is a great tribute to the ability with which the technical problems connected with this wide range of requirements have been attacked that such a great measure of success has been achieved.

The exposition this year was the fourth to be held in the United Kingdom, and when compared with the first (which was held in 1913) it is easily apparent that in the comparatively short interval which has elapsed the trade has undergone a vast change. In 1913 the moulding machine was the exception rather than the rule in Britain, whereas it is now common practice. An important lesson taught by the exposition is the extent to which power plant can be utilized for the production of castings. The importance of economic power utilization was emphasized by the large quantity of material which must be handled in comparison with output in foundry work.

At this year's exposition, apart from the display made by those actually engaged in the industry, the organizers for the first time obtained exhibits from research workers in Government establishments, trade organizations, and universities. The display of the British National Physical Laboratory included a high-frequency induction furnace unit suitable for 20-lb. melts of iron or copper alloy, induction furnace refractories and products, and a resistance furnace capable of working up to temperatures of 1,400 degrees Centigrade. Other exhibits illustrated the methods of determining the properties of castings. From Woolwich forged and rolled bars were displayed showing the distribution of impurities and their relation to segregation, and specimens illustrating recent developments in the electrolytic deposition of metals. Other exhibits from Woolwich illustrated methods of die casting brass and bronze alloys. The Metallurgical Department of the University of Sheffield contributed a chapter of history in the shape of Dr. Sorby's original metallographic preparations. The university's exhibit also included a collection illustrating the work of the Refractories Department, notably that of the ganister deposits of the Sheffield area.

The displays from Birmingham revealed the important position occupied by the Midland industrial area of Britain in the foundry trades. In addition to specimens and instruments in great variety from the University of Birmingham, the British Non-Ferrous Metals Research Association contributed samples and models to demonstrate the mechanical properties of ordinary die castings and what is being achieved in the research for improved alloys. The British Cast Iron Association exhibited moulding sands, special cast iron malleable castings, and samples of pig iron selected to show the difficulty of relating fracture and analyses. The association also illustrated methods of carrying out corrosion tests. Samples of typical qualities of pig iron from Britain's chief smelting centers were displayed by Mr. Shillitoe, and castings, with the runners and risers in place, were shown by N. J. Shaw.

The German exhibit was selected to show the best methods of organizing work in a foundry, the place occupied by costing

and statistics, and correct and incorrect methods of design of castings.

An interesting new addition to the foundry, displayed by the Rapid Magnetizing Machine Co., was a combined sand sifter and magnetic separator. It is intended for the treatment of used sand, the iron content being recovered and the sand sieved ready for use a second time.

A special display of scientific apparatus covered a wide range, including mould hardness testers, Brinnell machines, repeated impact testing machines, and temperature recorders.

A complete melting unit consisting of a Titan cupola having a melting capacity of 2 to 3 tons an hour was an object of interest on the stand of the Constructional Engineering Co., which concern also exhibited an 8-cwt. self-leveling ladle for use in foundries where large quantities of repetition castings are produced, and a geared crane ladle of three tons capacity with two pouring lips.

Some novel features were presented by a spark arrester shown by the Pneulee Machine Co., and an electrically-operated jar ram machine included in the exhibit has found plenty of application.

Shell-Mex, Ltd., displayed a 300-lbs. central axis oil-fired tilting furnace for metal melting made by the Monometer Mfg. Co. It was complete with oil burner, and was arranged to give a demonstration of the melting of ingots having low fusion points, and of pouring into moulds, as in shop practice.

A recent development in moulding machines is the pneumatic jolt ram turnover and pattern-drawing moulding machine, which was sent by John Macdonald & Son. This machine has a table 24 inches square and of 6 cwt. lifting capacity.

Refractory materials of all kinds were shown by the General Refractories Co. Firebricks of various types in the making of which magnesite, silver, chromite, sillominite, and fireclay are employed, were included.

Some of the famous manufacturers of pig iron displayed varieties of their productions for many requirements. Messrs. David Colville's exhibit included grades suitable for foundry, cylinder, and special castings, and the Consett Co.'s samples comprised all grades of haematite. Royal Dutch pig iron from the new Ymuiden plant in Holland was shown by Bessler, Waechter & Co. The samples were chosen to show the wide range of requirements met by varying the phosphorus and manganese contents. Castings made from the iron were also shown. Low carbon pig made at the Utrecht furnaces was also available for inspection, these grades being intended for special castings where a combination of toughness and strength is desired.

The general opinion of all who attended was that the 1926 exposition was the best that has been staged since the commencement of the series.

New Business Establishments in Mukden

In 1925, 2,260 new business establishments came into existence in Mukden, according to the records of the Mukden General Chamber of Commerce. They included a number of factories and workshops, e.g., 6 tanneries and makers of leather goods, 8 soap factories, 4 machine shops, 48 hosiery knitting mills, 89 weaving mills, one factory each for the making of buttons, gloves, and prepared manures. There were also 2 cigarette, 2 construction, and 9 transportation companies that came into existence or opened branches in Mukden during the same year. There were 91 new hotels, 241 restaurants, 148 pastry cooks, 30 tea houses, 59 tailors, 61 barbers, and 94 shoemakers that started business this year. The large number of new establishments in this group is the general feature of all large Chinese cities, but they do not always indicate increases, as an equally large number of old establishments often go out of existence at the same time. The substitution of iron for brick and clay stoves in household use was responsible for the establishment of 105 iron stove shops, while the increasing popularity of motor cars brought into existence 25 new garages. Low grade dentists are not known as dental surgeons, but "dental shops," of which four new ones were opened in 1925. Being the headquarters of the supreme military command of the Three Eastern Provinces, Mukden saw the establishment of 12 new makers of military uniforms, besides a sword and belt factory. Finally, four native banks are in the records as new establishments of the year.

A Singapore-Built Motor Boat

Twin-screw Cargo and Passenger Vessel

HSMART twin-screw steel motor vessel has recently been completed by the United Engineers, Ltd., of Singapore, to the order of Oei Bok Sien Bros. Steamship Co., Singapore and Riau.

The principal dimensions are as follow:—

Length overall	119-ft.
Length between perpendiculars	112-ft.
Beam moulded	21-ft.
Depth moulded	9-ft. 2-in.
Draught loaded	8-ft.
Deadweight	180 tons.
Speed	11½ m.p.h.

The vessel, which runs under the Dutch flag, is built entirely of steel, the scantlings being equal to Lloyd's. The hull is divided into five watertight compartments by four steel bulkheads. The forward part forms the chain locker, then comes the main hold, about 46-ft. long, amidships being occupied by the engine-room, 19-ft. 6-in. long, while aft of this is the after-hold, 28-ft. long, and the after-peck.

The main deck is of teak, bolted to beams fitted on alternate frames. The bridge deck is of teak, and occupies about three-quarters of the vessel's length from aft.

The forecastle deck is raised about 4-ft. 6 ins. above the main deck, below which is the crew's quarters, ample accommodation being provided for a crew of ten.

Aft of the forecastle is a large hatch, with the usual covers, tarpaulins, locking bars, etc. Between this hatch and the fore-

castle a pole mast and derrick are fitted, together with an electric winch capable of lifting 3 tons.

Aft of this hatch to the engine-room casing a spacious deck is provided for deck cargo or native passengers.

The after-hold has a hatch about 8-ft. square, served by an electric winch capable of lifting 2 tons, and a crane instead of a mast and derrick.

The clerk's and chinchee's (purser's) cabins are situated one on each side of the vessel, just aft of the hatch, fitted with double berths, settees, lockers, etc.

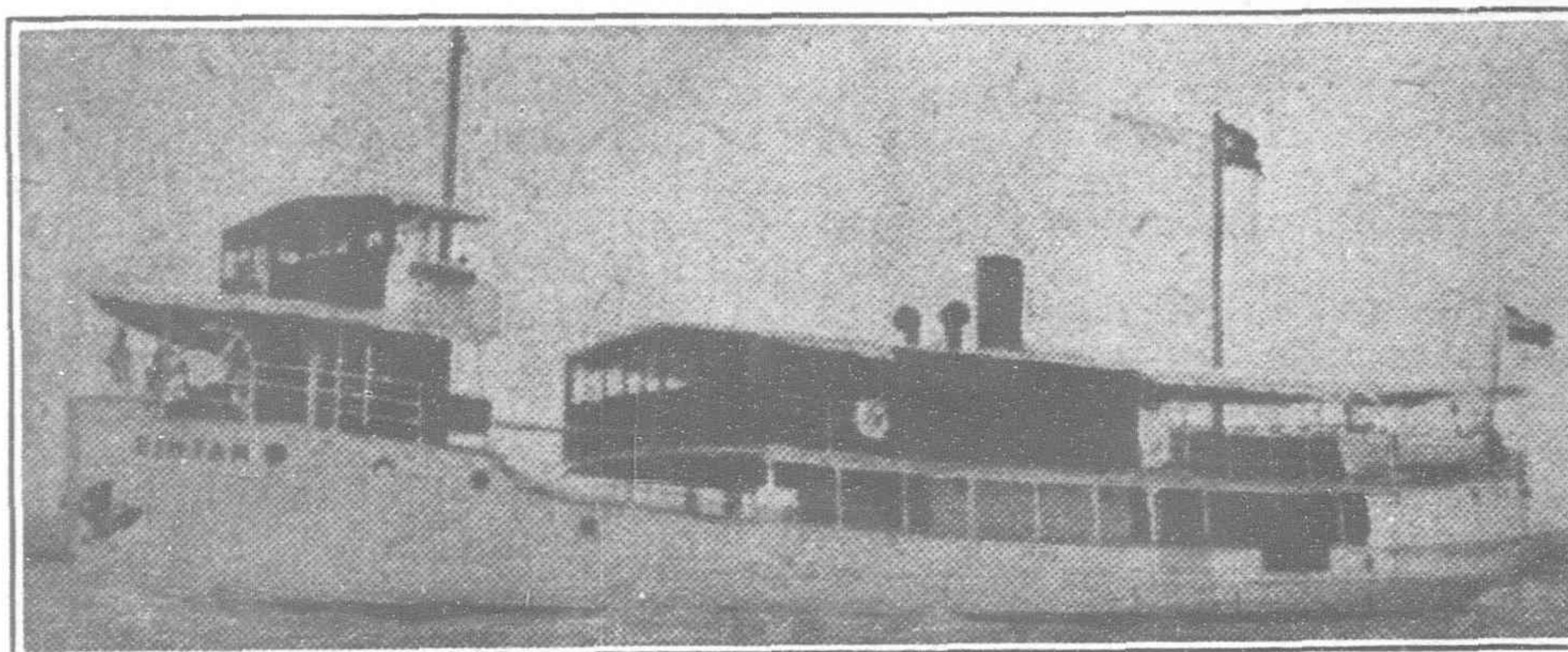
Between these cabins and the lamp-room is fitted a large ice chest capable of holding over 2 tons of ice.

A grating is fitted over the quadrant, while side screens are fitted round the stern to provide further accommodation for native passengers.

On the forecastle deck is an electric windlass for raising the anchors, hand gear being fitted in case of a breakdown to the motor.

Situated at the aft-end of the forecastle are cabins for the captain and chief engineer. Above these two cabins, extending the full width of the vessel, the navigation bridge is built, fitted with hand-steering gear.

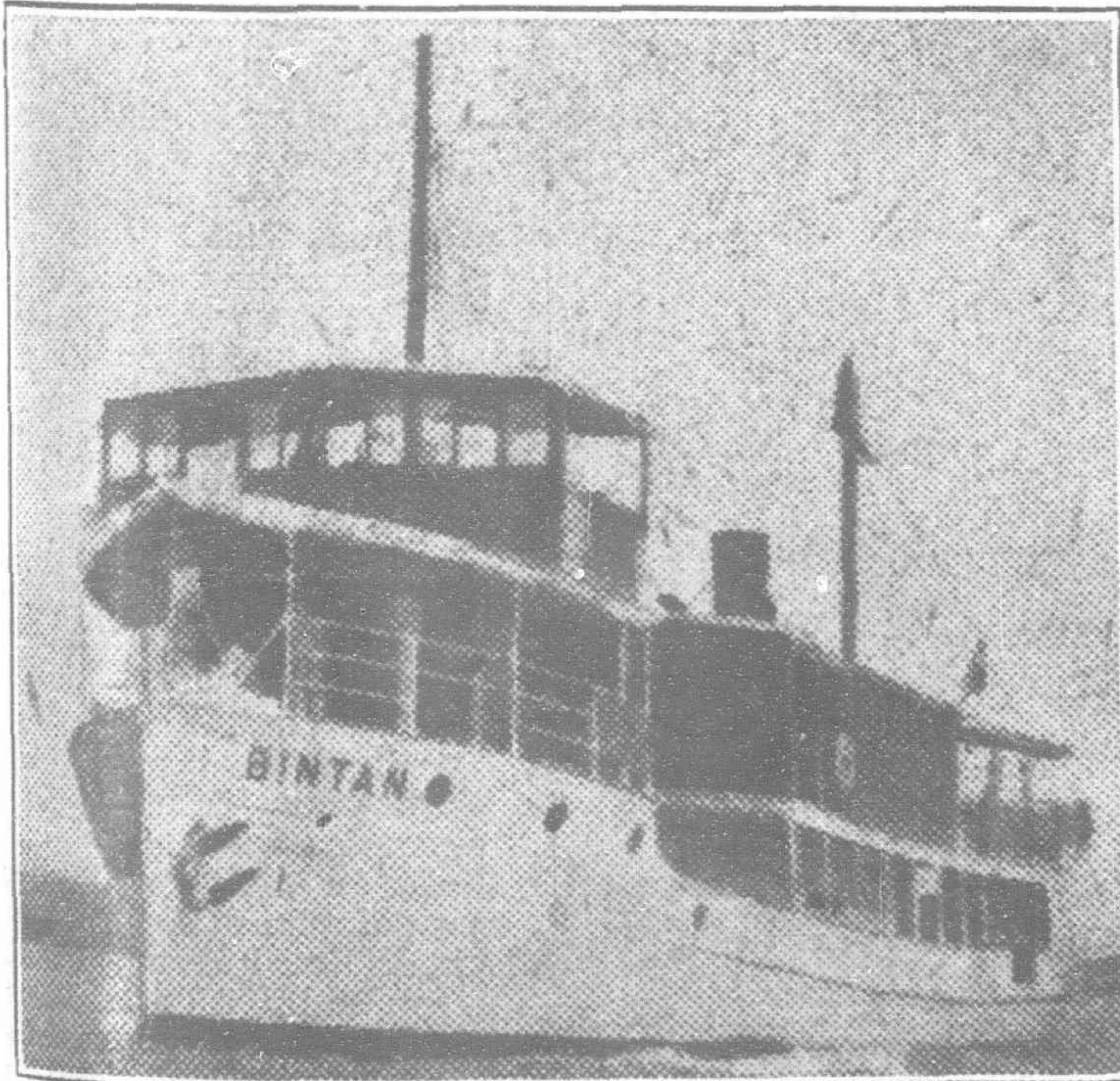
(Continued on page 495).



The "Bintan" at Sea



The Stern



A Bow View

Hulan-Hailun Railway

SURVEYS are in progress along the route of the latest new railway in Manchuria, the Hu-Hai line. This title is formed of the two first syllables of the names of the two main cities to be connected, Hu-lan-chen and Hai-lun-sian. These towns are situated to the north of Harbin at a distance of 20 and 200 versts (a verst is three-fifths of a mile) respectively, and are usually romanised as Hulan and Hailun.

The new line will start at Soun-bei, which has been specially built for this purpose. This town lies at a distance of six versts from the Chinese Eastern Railway and is connected by a branch line with Metaizsi, a C. E. R. station near Harbin. The Hu-Hai will run from Soun-bei north to Hulan, Suihua and Hailun. In the future, it is hoped to continue it to Mergen or Nunkiang via Erkeshan. The total length would then be about 416 versts.

The terrain to be traversed by the new line is considered by the Chinese to be one of the most fertile regions in Manchuria. Even in old times, this was well known. Ruins of five old cities have been found in the valley of the Hulan river, along which the railway will run. These cities existed in the 10th century and traces of cultivation may still be found. When Manchuria was conquered by the troops of Genghis Khan in the 12th century, these towns were destroyed. Later, Chinese settlers entered into possession of certain tracts, and toward the end of the 17th century, the Manchus also began to take an interest in the development of their home land.

At that time, North Manchuria was mostly inhabited by Mongol and Tungus tribes, which did not recognise any outside authority. A new element, however, soon broke down this exclusiveness. This was the Russian settler, who penetrated the country from the Amur district, and gradually subjugated the small local tribes. As a result, North Manchuria ac-

quired a great strategical importance for the Manchus. Manchu troops were introduced, local tribes were brought to submission by armed force, and after order had been established the Manchus turned their attention against the Russians. The presence of troops created the demand for supplies for their maintenance. Military posts were created in the Hulan valley, and the entire population of Chinese refugees was registered and divided into sections. In addition to this, 80 Chinese farmer families were brought from China by the Government. Manchus were likewise made to work the land, each family receiving an area of 10 shan. (a shan equals 1.8 acres).

Chinese historians note that the movement of Chinese settlers to the regions of the Hulan river became more intense toward the middle of the 19th century. Yet such settlement was illegal. The Manchu government maintained a ban against the migration of Chinese outside the Great Wall. Yet the local authorities furtively encouraged the introduction of Chinese settlers, because of their industry and capabilities in agriculture. Thus, the Manchu owners of the land gradually relaxed their hold, and

Chinese penetration became intense. The historians state that emigrants moved towards the Hulan river "like an ant-heap, or a bee-hive."

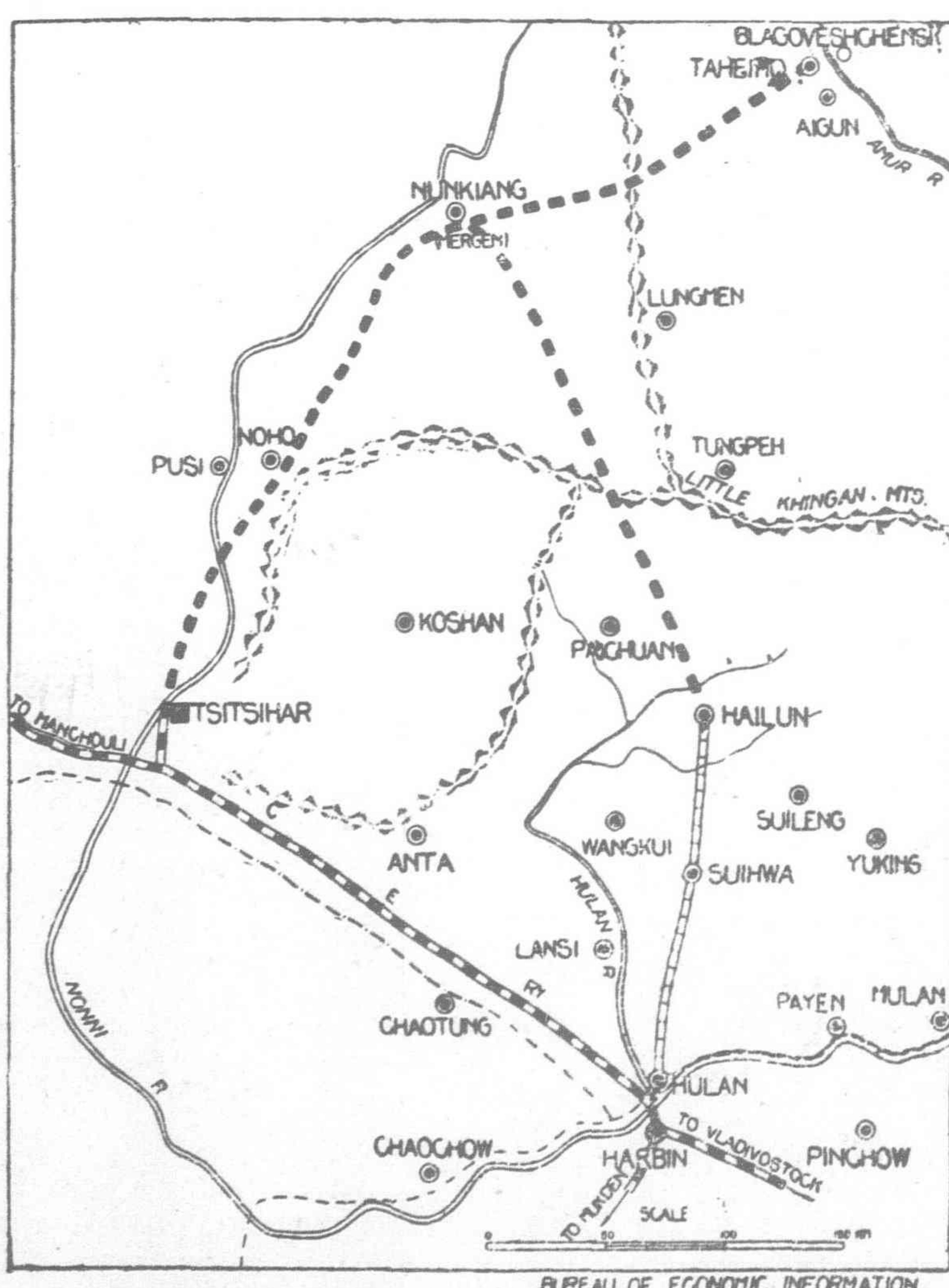
Then these migrations became legal in 1860 when two million shan of free land were divided into tracts in the regions of Hulan and Suihua. The influx of settlers increased, and beginning from 1878 a special Imperial order authorised Chinese women to cross the borders of China. Thus settlements began to assume a permanence which they had hitherto lacked.

The area available for colonization in the region of the Hulan river was insufficient to accommodate all these settlers, and the local authorities requested Imperial authorization to occupy lands belonging to the Mongolian Prince, Mannai-olt-gun. This was duly granted, bringing into use a considerable tract of territory. The authorities started a special bureau to look after settlers on Mongolian soil, and at this time the city of Hailun was built, and became the township for the new settlers.

Between 1905 and 1907 the old Manchu Government was completely abolished in north Manchuria in favor of a purely Chinese administration. Its first act was to start a colonization scheme in the Cherim district of Inner Mongolia. With all these settlements, particularly the impulse to colonization in the Hulan and Hailun territory, business began to develop, and the necessity of a railway line came to be realized for the export of products to the Sungari river ports and Harbin. The question was discussed in detail by the Tsitsihar Constitutional Assembly in 1909, when it was resolved to make arrangements for the formation of a promotion company. The Assembly insisted that the line should be built exclusively with Chinese capital, a problem which at that time was insoluble.

Then in 1910 Heilungkiang province entered into negotiations with local Chinese financiers and business men. It was decided to build a narrow gauge railway similar to that in operation between the city of Tsitsihar and the Chinese Eastern Railway, but with rails of a heavier type. However, many difficulties, such as bridging and tunnelling work, had not been taken into consideration, and the estimates for costs were inadequate. Later, these latter were adjusted to Tls. 3,700,000, which it was hoped would help the promoters to build a railway having the same gauge as the Japanese railways. Capital was to be obtained from the local Chinese banks. In this scheme the participation of the Chinese Government to the extent of a million taels was depended upon, the balance to be subscribed by the public. The security mentioned was the Tsitsihar branch line.

Surveys were initiated in 1914 at the instance of the Ministry of Communications in Peking, but more difficulties arose, the principal of which was the signing in 1916 by the Government in Peking of a contract with the Russo-Asiatic Bank for a railway running from Harbin to Mergen, with branch lines from that city to Aigun and Tsitsihar. A sum of £5,000,000 at 5 per cent. interest was to be advanced by



Hulan-Hailun Railway

the bank to the Government at the end of the European War. This agreement stopped all activities by the local authorities. As for the Russo-Asiatic Bank, the conditions prevailing in Russia at the end of the War brought about the non-realisation of their contract. Construction work was again delayed indefinitely. However, the people of Heilungkiang province remained alive to the need of the railway, and in this interest they were supported by Gen. Wu Chun-hsing, Governor of Heilungkiang. He it was who undertook to organize financial support, which he succeeded in doing toward the end of 1925.

Construction of the line is now at last in progress. It is being built with Chinese capital exclusively. Fifty per cent. of the funds are being furnished by the Tsitsihar Provincial Bank, 30 per cent. by the provincial authorities, and 20 per cent. by public subscription. Participation of foreign engineers in construction work is limited to the purely technical side of the undertaking. Costs are estimated at \$35,000 per verst of line, including all equipment and rolling stock. The gauge is to be standard, similar to that of the Chinese Government railways.

It is hoped to make the railway a paying proposition immediately after construction. In addition, the plan is to create a series of concurrent enterprises for the exploitation of the forest and mining resources of the central and western parts of the little Khingan range. The Economic Bureau of the Chinese Eastern Railway is responsible for the statement that these regions supply Harbin already with 20 million poods (a pood is 36 lb.) of freight by cart yearly. It is thought that the railway will be beneficial to the Chinese Eastern Railway in that freight coming down the Hu-Hai will be transferred to the Sounbei branch line of the Chinese Eastern Railway to Harbin. This seems to have been realized by the Chinese Eastern Railway, for a special tariff has been granted by that line for the transportation of building materials and equipment in connection with construction work on the Hu-Hai.

The prevailing estimate of the population in the area to be served by the new line is three million. These are now distributed over four million *shan* of territory. It will be seen, therefore, that the line will undoubtedly attract new settlers. Production from the best ground at present is about 63 poods of grain per *shan*, the average being about 52 poods. The whole region is at present raising 200 million poods of grain per year, and the surplus export is estimated at 60 million poods.

The average cost of transportation will probably be established at the rate of 2.4 cents along the whole line. In this case the gross operating income of the railway should be about \$4,800,000. It is expected that the accretion of grain surplus will be 40 million poods, making a total of 100 million available for distribution. The western part of the railway will skirt the little Khingan, which is rich in minerals. The central and western parts are covered with forests, absolutely untouched as yet.

When traffic opens on the western district of the railway, the exploitation of coal and other minerals, as well as of the forest wealth, should be stimulated, thus providing additional freight to the Chinese Eastern Railway.

Cooling Water Barrages for Power Stations

In view of the great development throughout the world in the use of barrages for irrigation and hydroelectric work, it is worthy of note that this principle is now being applied to the ordinary steam-driven electric station so as to give an adequate reserve of cooling water, a subject which has received too little attention in the past, especially in view of the increased cost of cooling towers.

The general principle is to erect a dam in the river or other source of water supply, which raises the level behind and frequently forms something in the nature of a small reservoir of much greater width than the original river. On these lines millions of gallons of water can be stored up and used as required, the dam being fitted with sluice-gates, which are raised or lowered so as to keep the volume of the impounded water within any desired range. Typical of the latest modern practice in this field is the new Colenso electricity station at Maritzburg, South Africa, for the supply of current for the electrification of the Glencoe line

now being undertaken by the South African Railways and Harbors Board. The Tugela River is the source of the cooling water, and a barrage is being erected to increase the reserve supply. For this a British engineering concern is supplying four steel sluice-gates 40-ft. wide by 7-ft. deep, two sluice-gates 10-ft. wide by 9-ft. deep, and two 32-in. by 48-in. deep, being of the latest free-roller pattern, such as are being fitted all over the world for irrigation and hydro-electric work.

These gates run up and down on a train of rollers, which, for the Colenso installation, will be of cast iron 6-in. in diameter and 6-in. long, machined with great accuracy to 0.002 inches, so that each roller takes its correct share of the weight, also being enclosed in a mild steel cage fixed in cast iron shrouded guides, so that the velocity of the water passing through the gates cannot cause any vibration. Further, the usual accessories are embodied in the way of rocking paths, stauching bars, and gunmetal joint faces, while the gates will be raised or lowered electrically, local, remote, and automatic control being all provided.

The level of the river will in this particular case normally be raised 7-ft., but the design is such that in an emergency even 35-ft. can be withstood, as the Tugela is liable to sudden rises. Again, if required, each gate can be raised by hand with one man only. The hoisting ropes are of galvanized steel wire of six strands, giving 1½-in. overall diameter, and having a net breaking strain of 43 tons. A very good example of such plant in Great Britain is at the Kilmarnock Corporation Electricity Station, where the River Irvine is dammed back by a single very wide steel sluice gate, of 70-ft. span, which raises the level of the river about 7-ft., resulting in a very great increase in the cooling water reserve.

Railways in South Sumatra

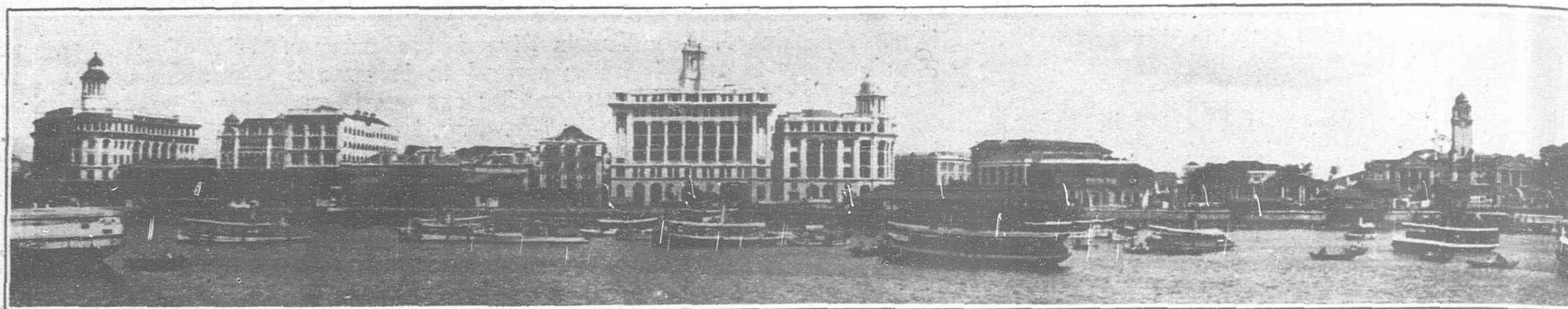
Assistant Trade Commissioner C. P. Goodhue, Batavia, Java

IT has been proposed to extend the railway net of south Sumatra to the hinterland of Moeara Bliti (the highlands of the Pelembang and Bengkoelen Residencies), where agricultural development has been considerably handicapped by the lack of adequate transportation facilities. The provisional proposal was to construct a line from Padangoelaktanding to Moeara Klingi, enabling more economical overland transport from the agricultural area concerned to the latter point, whence transportation to Palembang is effected by paddle steamer along the Moesi River. It was intended to substitute this line later with a line to Lahat, affording through railway connection with Palembang.

Advantages and Proposed Route

This provisional scheme was considered because of the uncertainty which then prevailed regarding the remunerativeness of a connection with the main line. Further investigations, however, together with an improvement in local finances, has decided the Government to extend the line ending at Lahat to Loeboeklinggau in the agricultural area concerned. The advantage of this through connection is obvious, as the Moesi River is unnavigable during periods of drought beyond Moeara Lakitam, between Moeara Klingi and Palembang. Further, though the cost of transportation by steamer is much cheaper than by rail (being from 60 to 80 cents per picol), the cost of transport by motor truck (from Loeboeklinggau to Moeara Klingi) is so high that through transport by rail is considerably more economical.

The proposed line between Lahat and Tebingtinggi will run in the neighborhood of the public road now connecting the two places, but will be 66 kilometers long to the road's 77 kilometers. From Tebingtinggi the railroad will run to Moeara Bliti and thence to the village of Moeara Soeling, where it will branch westward along the Bliti Valley for about 10 kilometers, and then run direct to the terminus at Loeboeklinggau at the junction of the roads to Soeroelangoen and Djami and that leading to Bengkoelen from Moeara Bliti. The cost of the construction is estimated at 15,000,000 florins, for which an appropriation of 1,000,000 florins has been made in the 1927 budget. The period required for construction will probably be four years.



Singapore's New Sky-Line from the Harbor

Singapore Municipal Engineering Activities

[This Interesting Series of Articles on Singapore Municipal Activities was Published in the "Singapore Free Press"]

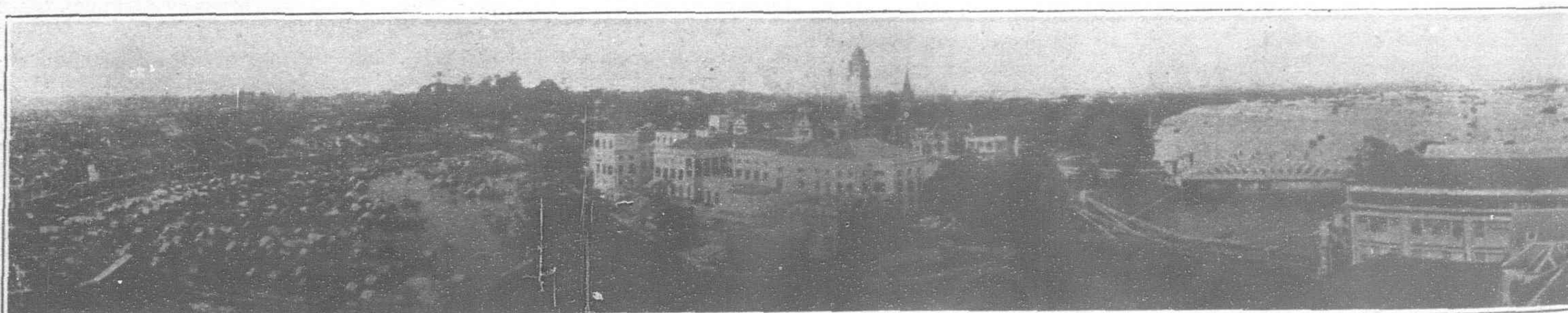
Roads.—Reconstructing Tramway Routes

CHE decision of the Municipal Commissioners, made a few years ago, to permit the running of railless trams on the main thoroughfares of the town of Singapore instead of the present railed system, has resulted in the Municipality being provided with what is possibly one of the best equipments for manufacturing and laying bituminous road pavement outside of America and Europe. The Municipal Quarries, the stone crushers, the Barber and Cummer

land Cement, and happens to be equally as good for use as "filler" in bituminous pavement.

The Problem of Foundations

One of the chief problems which confronts the Municipal Engineering Staff here is that of foundations, the town of Singapore being largely built upon reclaimed swamps. This problem is manifest whether dealing with roads, bridges, sewage pumping stations, sewage disposal works, or sewer construction. In regard to road construction the problem is dealt with where the sub-grade is particularly bad—Lavender Street for example—by providing reinforced concrete roads with a high percentage of Portland Cement in its composition, about 33 per cent. Elsewhere heavy



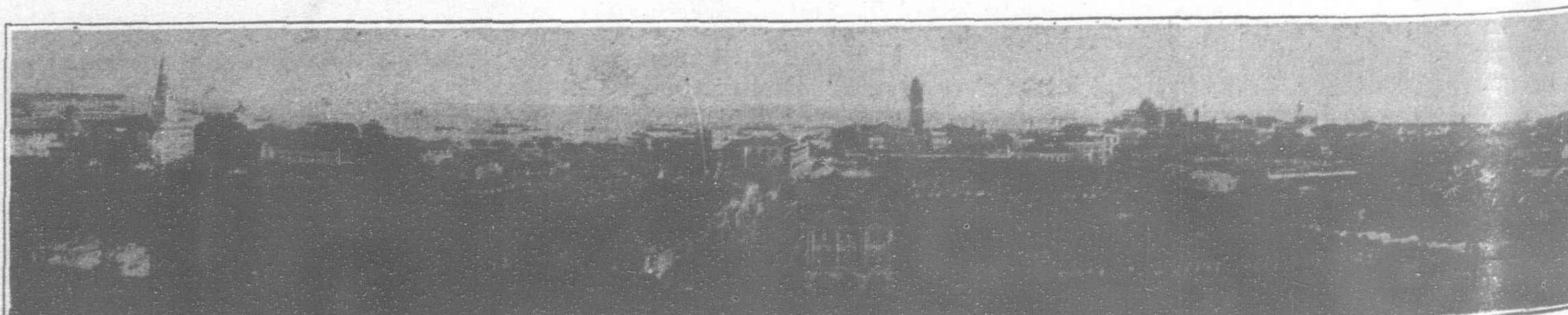
Singapore River and Group of Government Buildings

asphalting plants, and the special quick-reversing tandem rollers, all necessary for producing the modern asphalt paving, have been described at length in annual reports and in the press, so there is no need to describe these again. The latest adjunct to the road paving equipment is a Griffin Mill, installed at Tanjong Pagar Depot. This produces an impalpably fine dust (which is an important constituent of asphalt paving) from crushed granite. Formerly Portland Cement was used to supply the requisite finely ground mineral "filler." Needless to say granite dust is much cheaper than Port-

land Cement, and happens to be equally as good for use as "filler" in bituminous pavement.

Reconstructing Tramway Routes

The inauguration of trackless tramways in Singapore, and the elimination of the present railed system, will enable the Municipality to complete the reconstruction of one of their most heavily trafficked



Singapore: View Looking Towards the Harbor

thoroughfares in the town, namely—Tanjong Pagar Road, South Bridge Road and North Bridge Road. For some time past the Geylang-Tanjong Pagar route via Geylang Road, Kallang Road, Victoria Street, Hill Street, New Bridge Road, Upper Cross Street, part of South Bridge Road, Maxwell Road and Anson Road, on which the new trams will make their first appearance, has been ready for their use, but the non-arrival of certain equipment has delayed the commencement of the service.

The programme for road reconstruction in Singapore is an extensive one, but owing to the shortage of funds at present, the tramway routes are not being reconstructed at the quick rate which was possible last year. As soon as the new railless trams are running on the Geylang-Tanjong Pagar alternative route as detailed, it will be possible to remove the old worn out tramway lines on Tanjong Pagar Road, South Bridge Road and North Bridge Road and to reconstruct this thoroughfare in one operation, instead of three operations, which has perforce been the case on most of the other tramway routes.

This route cannot be opened to trackless trams until the reconstruction of Elgin Bridge, already commenced, has been completed. The reconstruction and widening of this bridge will be a difficult operation owing to the bad foundations. The foundations of the bridge will be built on six caissons, constructed of reinforced concrete with a steel "cutting edge." These will gradually sink by their own weight as they are built up, by excavating the mud in their hollow interiors, until a solid stratum of clay is reached, about 70 feet below road level. The first of these caissons is already being sunk on land purchased from Messrs. Boustead & Co. This is on the widened portion of the bridge.

The Post Office Subway

After the completion of the Tanjong Pagar Road, South Bridge Road and North Bridge Road section there will then only remain to complete the Serangoon Road, Selegie Road and Bras Basah



Type of New Trackless Tramways Which will Supercede the Old Trolley Tramways

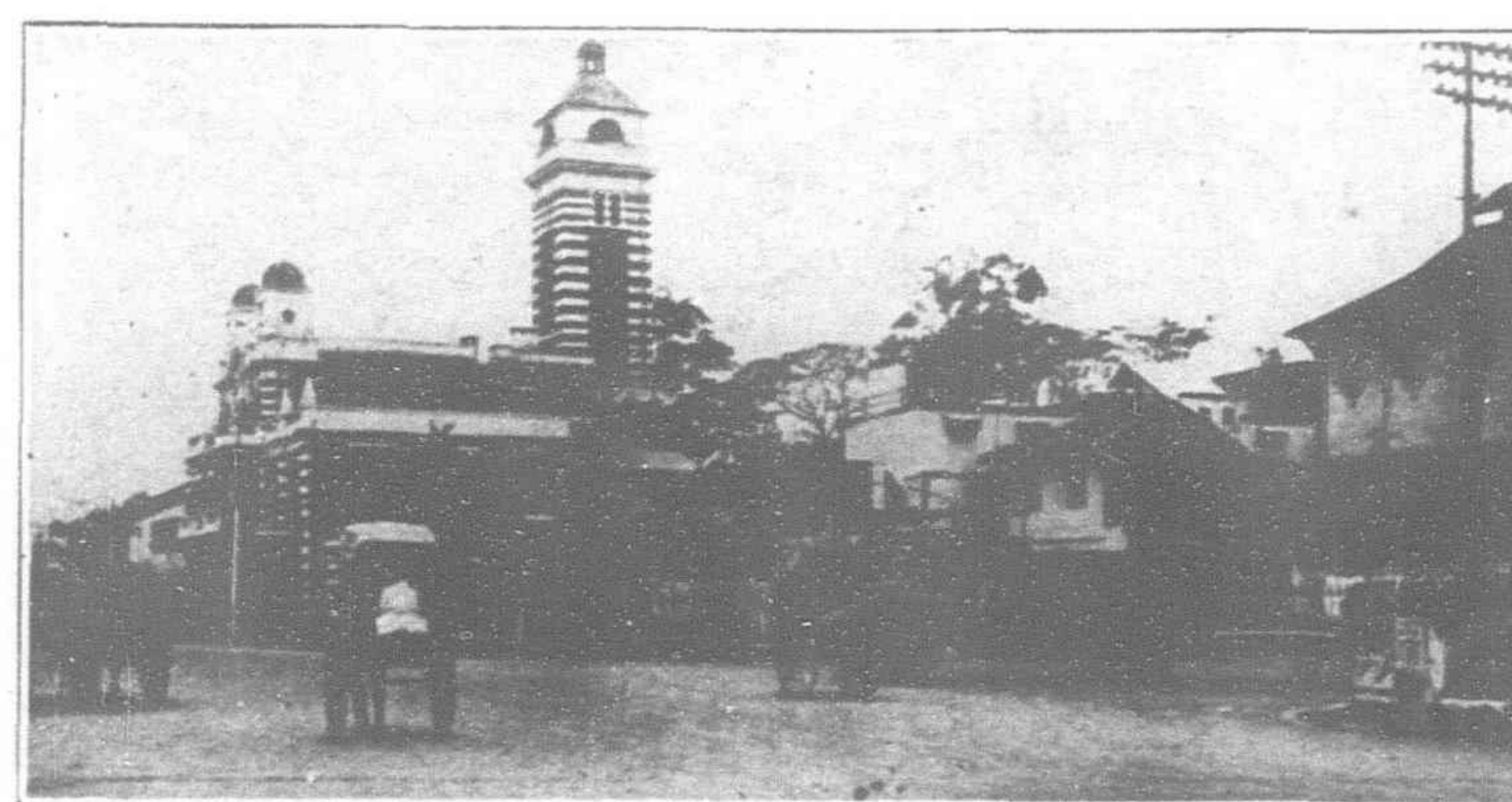
Pier, is completed. This work, which has been in progress since the middle of May, is of an interesting nature, as several special features are embodied in its design. Ferrocement—a quick setting cement which sets as strongly in 24 hours as ordinary

Portland Cement sets in a month—is being used in order to expedite the completion of the job. The sub-way, which is being built by the Municipal Engineering Department, will be square in section, the internal measurements being 8 feet by 8 feet. At the seaward end of the sub-way a spiral chute will be constructed and at the other end a lift. This sub-way is intended for use in connection with local seaborne mails.

In reconstruction, the railless tramway routes have for the most part been surfaced with sheet asphalt $1\frac{1}{2}$ inches thick, laid on a binder course of bituminous concrete also $1\frac{1}{2}$ inches in thickness. A new method of road construction is being tried out on Serangoon Road, a weak grade of concrete consisting of 1 part cement, 3 parts of sand, and 6

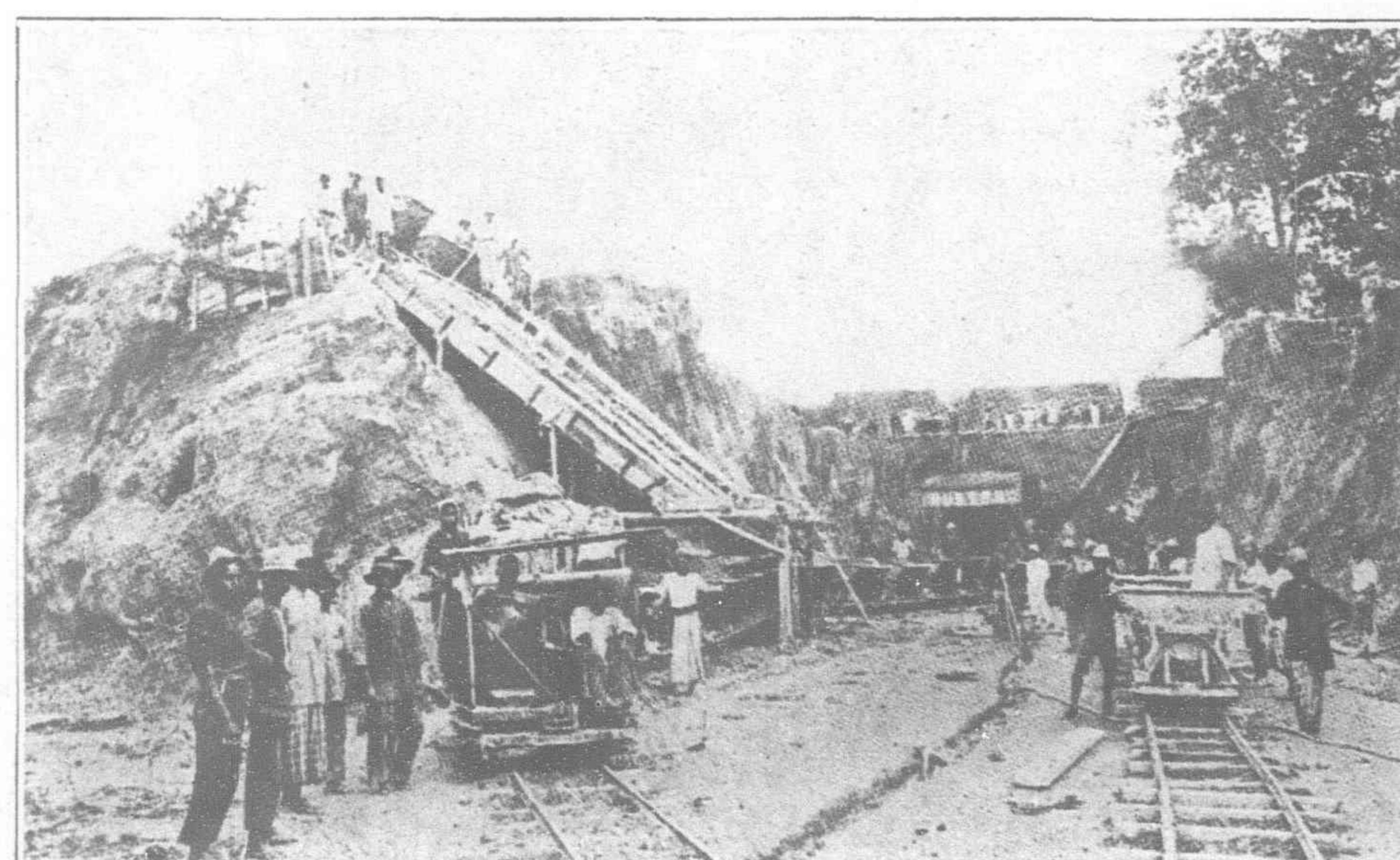
parts of crushed granite, 8 inches thick, being employed in lieu of the heavy block foundations laid hitherto. In this case the binder course of bituminous concrete will be dispensed with, and the sheet asphalt surface will be 2 inches thick.

Elgin Bridge is not the only bridge in the town which is in need of urgent reconstruction. The bridge carrying Grove Road over the Geylang River is in a dangerous condition owing to the settling of the foundations, and it will be necessary to build another bridge parallel to it on the down stream side at an early date.

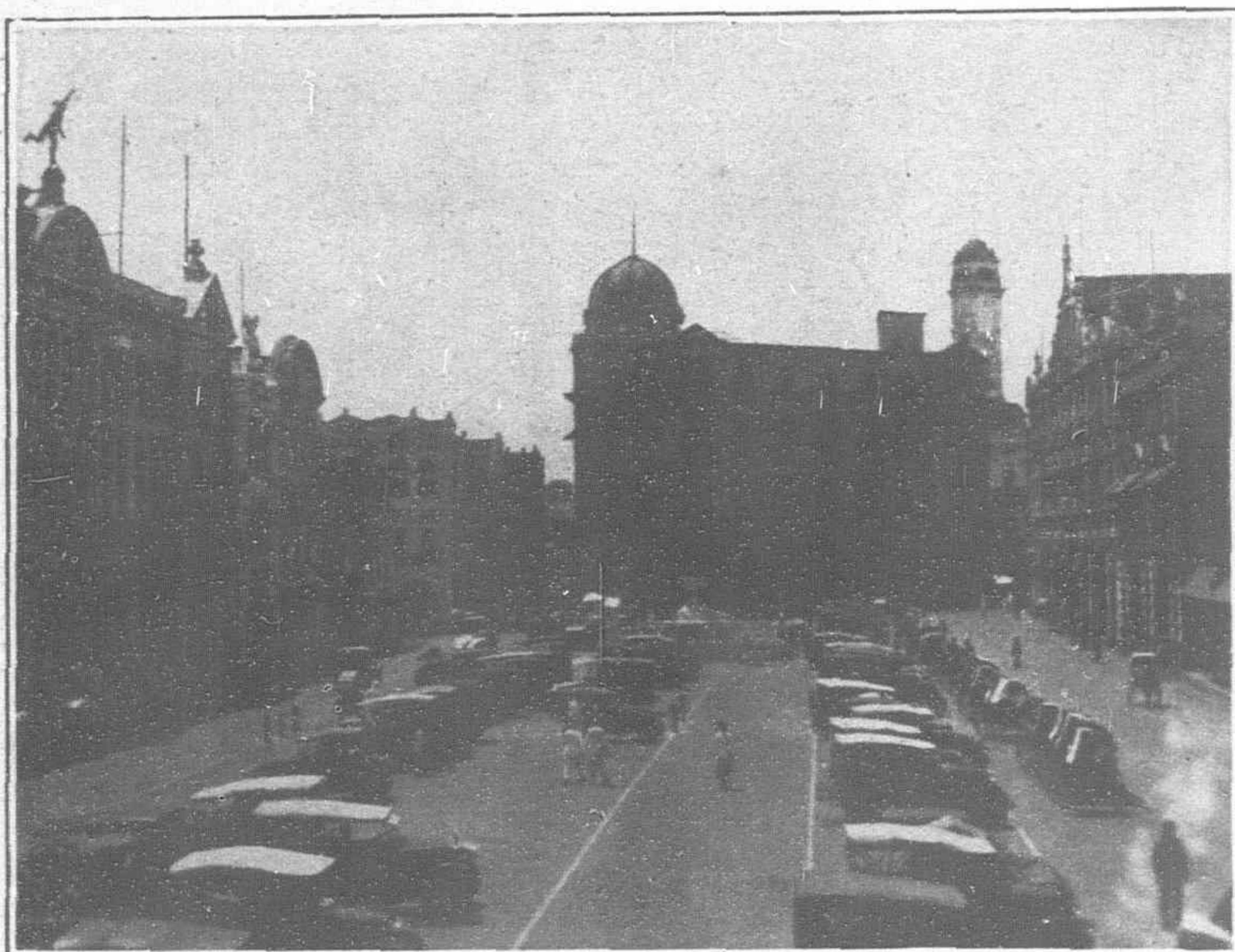


Municipal Motor Fire Department Headquarters on Hill Street

parts of crushed granite, 8 inches thick, being employed in lieu of the heavy block foundations laid hitherto. In this case the binder course of bituminous concrete will be dispensed with, and the sheet asphalt surface will be 2 inches thick.



Cutting Through Hill Between Havelock Road and Outram Road on Pipe Line from Johore



Raffles Square: The Business Center of Singapore

The new bridge will be carried on a reinforced concrete raft; were this not done the new bridge would have to be supported on concrete piles each over a hundred feet in length.

Water Distribution.—Ensuring Purity

Having described the sources of Singapore's future supplies and before proceeding to deal with the methods of distribution, no harm will be done by referring to the care that is taken to ensure the purity of the water. Chemical and bacteriological examinations of a score of samples are made daily, and while the catchment areas are preserved from pollution by excluding people from living in them, it is also possible to take the further precaution of chlorinating the water at any time, using chlorine gas, if it is thought desirable. As a result, and when, owing to the water shortage, it has not been possible to flush mains as much as they should be flushed, the water has at times been unpalatable, from a health point of view it has always been good. The third means of ensuring purity are the filters, and at Woodleigh and Bukit Timah Road there are 13 acres of slow sand filters. Unfortunately, very frequently during the last five years it has been necessary to throw the filters out of use so as to enable the pipelines from the impounding reservoirs to bring down the necessary amount of water to meet the needs of the town.

Where the Water Goes

Shop houses are the largest consumers of water in Singapore, for they are supplied daily with roughly 7 million gallons of the

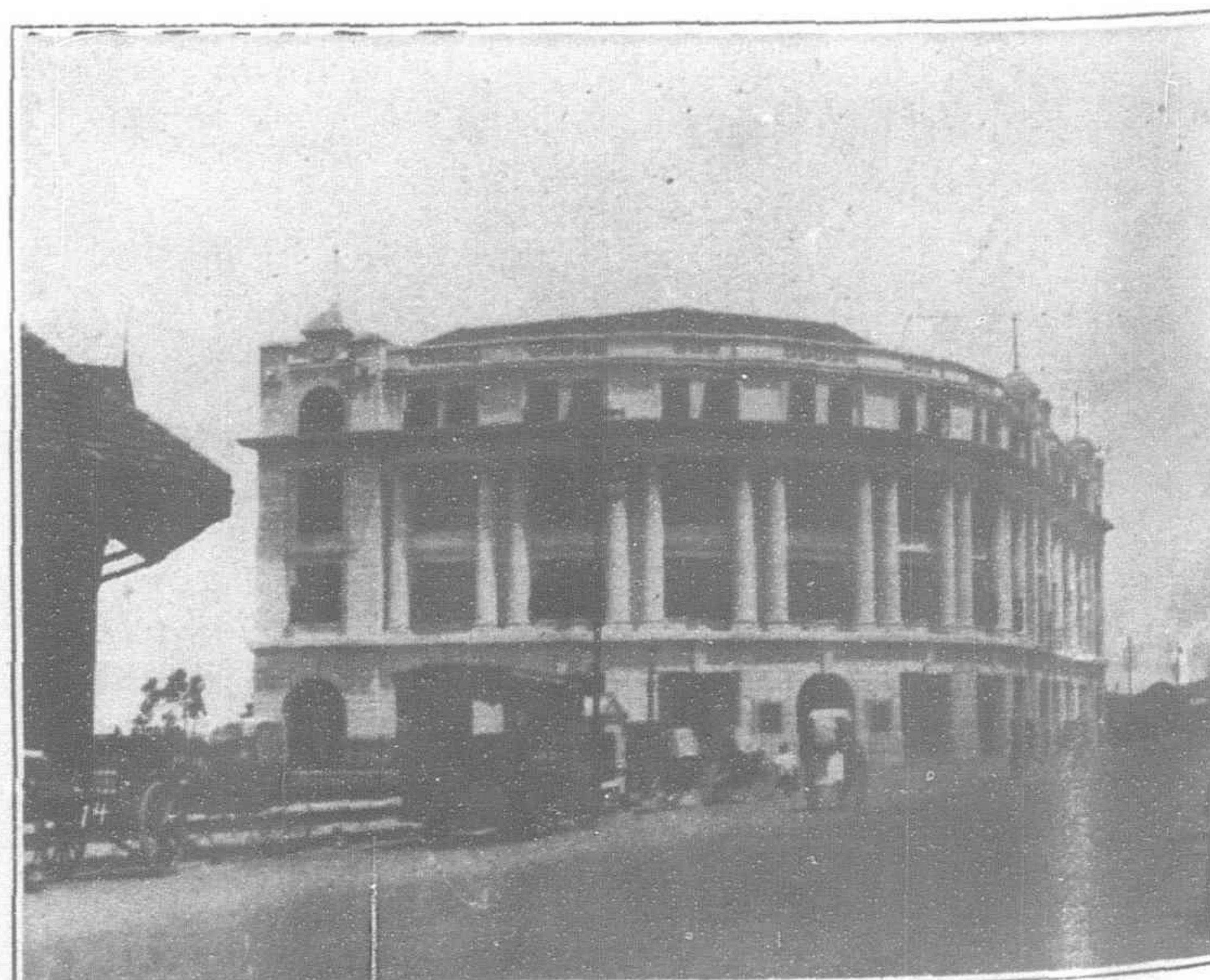
12 million gallons supplied. Compound houses, stand-pipes, and the Municipal services each absorb 1 million gallons, trade and factories 750,000 gallons, Government services and shipping each take 500,000 gallons, and mineral water and ice factories 250,000 gallons. The amount supplied to shipping is rather surprising ; it is computed that the population on sea-going ships in the harbour is in the neighbourhood of 11,000. This is a continually changing population and the inference is that there are probably about 40,000 people at sea who are drinking Singapore water—which, incidentally, has the reputation of being as good as that obtainable anywhere in the East.

Distribution.—A Dangerous Position

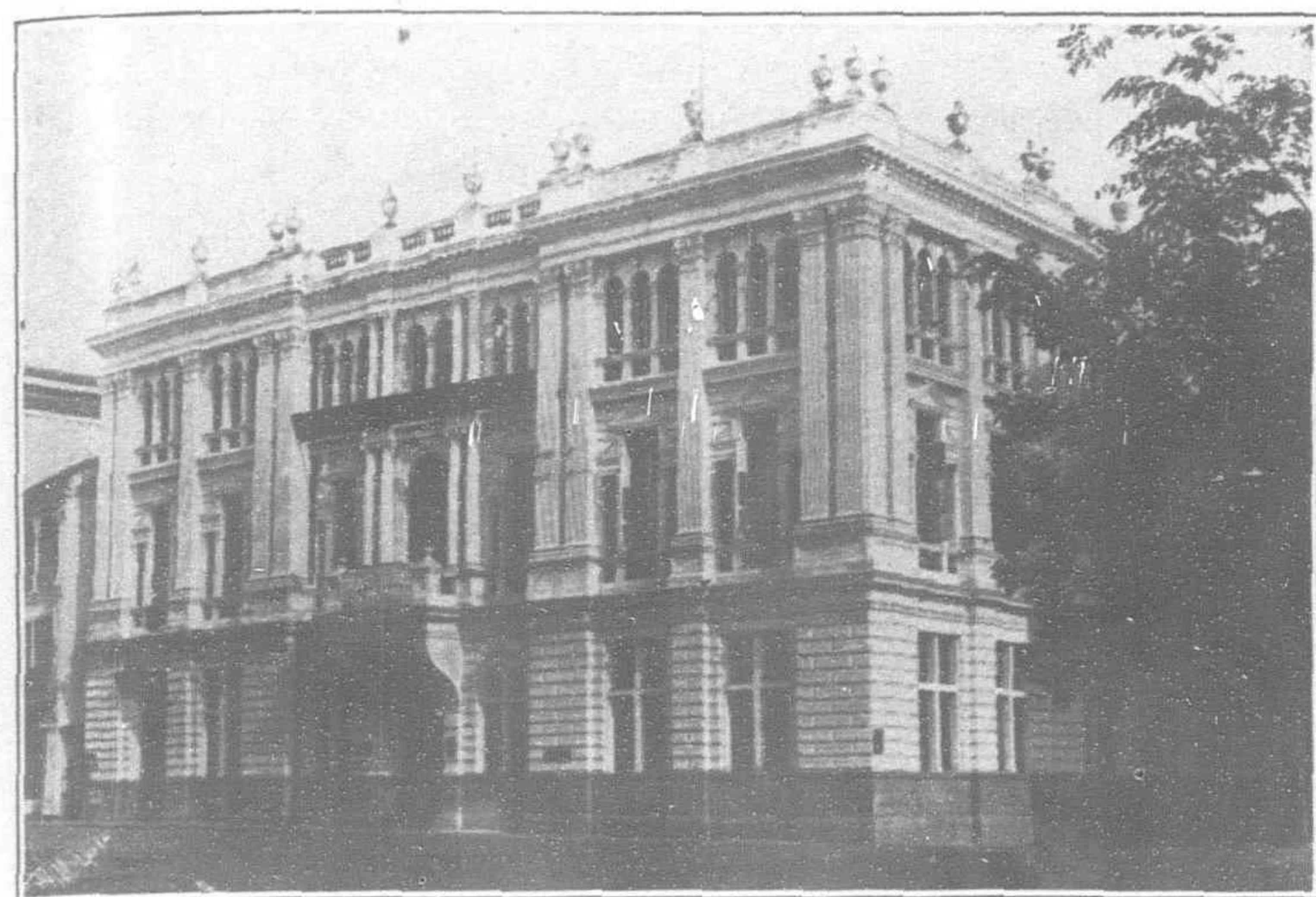
The biggest item in new works as regards distribution is the construction of the Fort Canning service reservoir, which will hold 32 million gallons, this being in addition to the existing service reservoir at Pearls Hill containing 6 million gallons ; so that Singapore will have a total service reservoir storage of 38 million gallons. The construction of the Fort Canning reservoir is very necessary, in view of the fact that it is considered desirable for a town to have a service reservoir capacity equal to three days supply. The maintenance of the water supply to Singapore at the present time is a very delicate operation on account of the very small service reservoir capacity. At the present time there are two service reservoirs, one at Pearls Hill and one at Mount Emily, with a total capacity of 8 millions. The daily consumption in Singapore is



The New Union and Hongkong & Shanghai Bank Buildings



New Cable Building



Mitsui Bussan Kaisha and Bank of Taiwan

some $12\frac{1}{2}$ million gallons, most of which is used during the 12 hours of ordinary day time. In the event of a very serious burst occurring in the middle of the day which depleted the amount of water in the service reservoirs to any great extent the inflow of water to the service reservoirs would not be great enough to keep the town supplied, and it would be necessary to shut off.

Dispensing with Mount Emily

At the present time the 12 million gallons collected from the catchment areas on the island is pumped at the Mackenzie Road Pumping Station. For the purpose of distribution the town is divided into two districts; the high pressure district, supplied from Pearls Hill; and the low pressure district supplied from Mount Emily. On account of the elevation of a large proportion of the houses to be supplied it has been decided to discontinue the use of the Mount Emily service reservoir and bring the whole town under the high pressure system from Pearls Hill and Fort Canning, when completed. To do this it has been necessary to build a pumping station at Woodleigh, which is now practically completed. The Woodleigh Pumping Station can pump $8\frac{1}{2}$ million gallons a day to a height of 180 feet, the pumps which have been supplied being about the latest development in pump efficiency, similar in type, in fact, to the set which has just been erected for the Metropolitan Water Board, London. In future, therefore, water received from the MacRitchie reservoir will be pumped at Mackenzie Road and the water received from Peirce Reservoir will be pumped at Woodleigh, and both of these pumping stations will deliver water to Pearls Hill and or Fort Canning when it is completed. The water from Gunong Pulai and Pontian Ketchil will also flow to these service reservoirs.

Water Supplies.—Further Details of Johore Schemes

The first public works for the supply of water to Singapore were undertaken in 1857. They comprised an intake in the vicinity of the present MacRitchie Reservoir and a masonry conduit to convey the water to town. Alterations and extensions to these works were made from time to time and pumps and distributing works were constructed in town prior to 1878, while in 1876 the



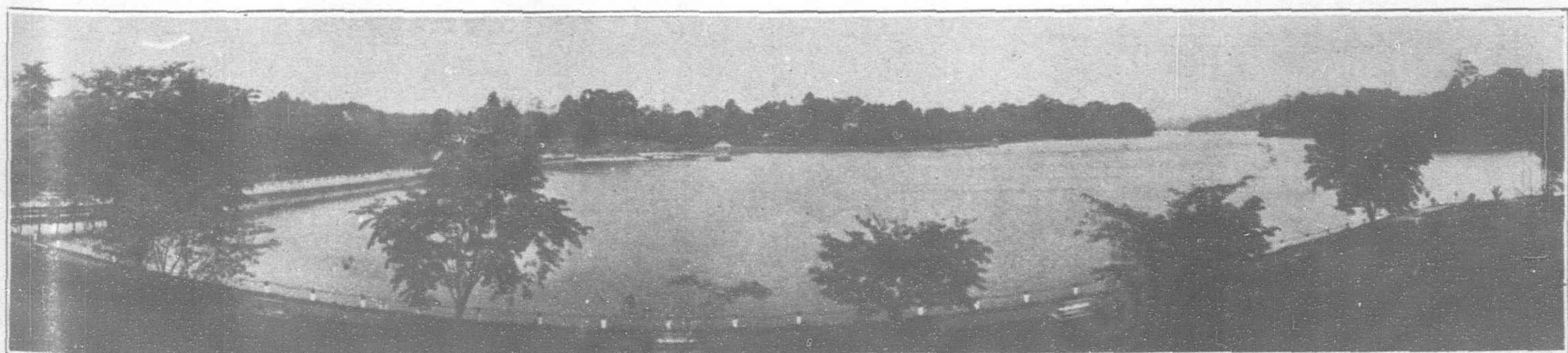
Whiteaway, Laidlaw Building

masonry conduit was replaced by a cast-iron main, 24 inches in diameter, laid along Thomson Road.

The MacRitchie Reservoir as at first constructed was completed in 1868, but in 1894 it was enlarged by the construction of the present embankment at a point lower down the valley. A second line of cast-iron pipes, 24 inches in diameter, was laid along Thomson Road and brought into use in 1898. A further enlargement of MacRitchie Reservoir was completed in 1905 by raising the embankment an additional five feet, thus making the maximum depth $26\frac{1}{2}$ feet and the total capacity 1,003 million gallons.

The necessity for securing additional sources of supply was recognised in 1901 and in the following year Mr. R. Peirce, the Municipal Engineer, outlined a scheme of extensions which received the approval of Government in 1904, actual construction being commenced in 1906. The second reservoir, known as the Peirce Reservoir, was formed by constructing an embankment across the valley of the Kalang River at a point near to the $6\frac{3}{4}$ mile, Thomson Road. The total catchment area contributing to this Reservoir is 3,007 acres, comprising 1,538 acres in the upper part of the valley and 1,469 acres in the lower part of the valley. The water collected in the upper part of the valley may be intercepted and diverted through the Kalang Tunnel into the MacRitchie Reservoir or may be allowed to flow into the Kalang River Reservoir. The top water area is 253 acres, the maximum depth 28 feet, and the total capacity 923,000,000 gallons.

The Seletar Works, which included the construction of a reservoir, pumps and pipeline, which came into use in 1923, complete the sources of supply on Singapore Island, the Seletar area providing on the average two million gallons a day into the Peirce Reservoir. These sources have been adequate to meet the needs of the town until the last few years, but for a long time it has been dangerously obvious that they would have to be supplemented. This need has been emphasised this year during the recent spell of dry weather. The daily consumption of water in Singapore is some $12\frac{1}{2}$ million gallons—on a very dry day it has reached as high as $14\frac{1}{2}$ million gallons, falling to 11 million gallons on a particularly wet day—whereas the sources of supply on the island are only capable of supplying 12 millions daily with safety.



Reservoir Singapore Water Supply

First Investigations in Johore

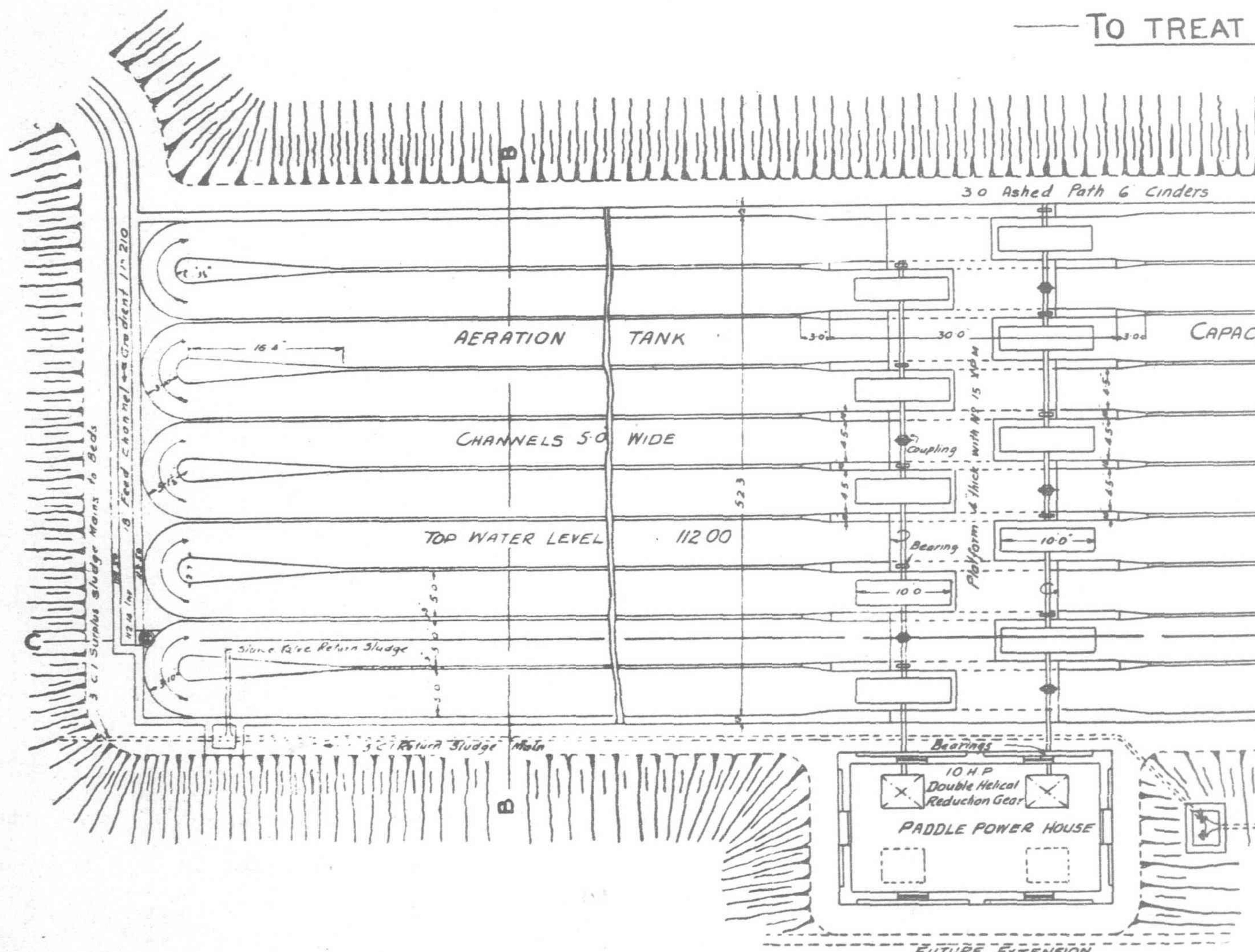
In the search for new catchment areas eyes turned naturally to Johore. As long ago as 1904 Mr. Peirce foresaw and reported on the necessity of going to Johore for additional supplies. In 1912 and 1913 he visited Gunong Pulai, Lengui and Sisil Bahru districts, and from 1920 to 1923 extensive explorations were carried out in Johore by Mr. S. G. Williams, the Water Engineer, at Gunong Pulai, Skudai River, Sungai Pelepah, Sungai Lengui, Semangar and Tibrau. During 1922 Sir Alexander Binnie, Son and Deacon were appointed consulting engineers to the Municipal Commissioners

and, having made various reports, finally recommended the adoption of the Gunong Pulai scheme in December 1923, and work on this scheme is now progressing well. The scheme has been so fully described on previous occasions that it is not necessary to go deeply into it.

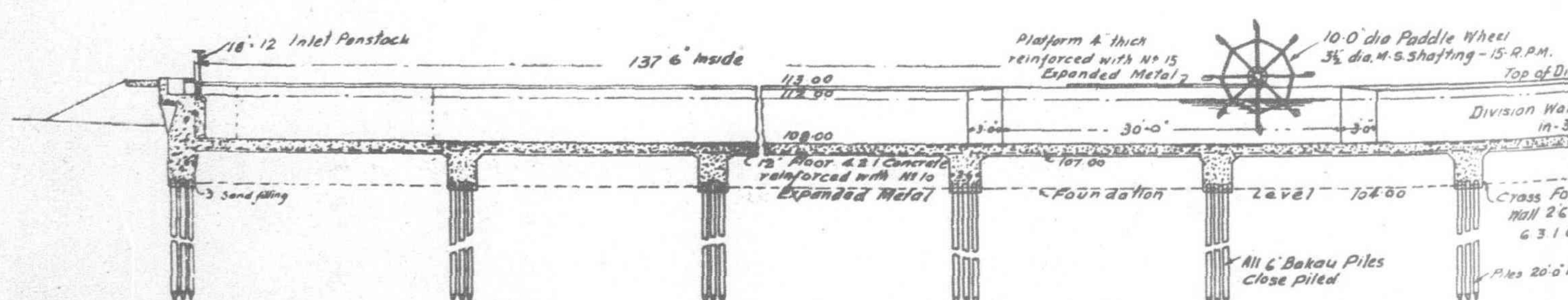
It should first be explained that it is estimated that the consumption of water in Singapore (including the Rural Board areas, and Johore Bahru, which has to be supplied from Pulai under the agreement which rendered this source of supply available to Singapore) will have reached 18½ million gallons daily by 1931. When fully developed the Johore scheme will supply an additional 20

MUNICIPALITY OF SINGAPORE-AERATION UNIT

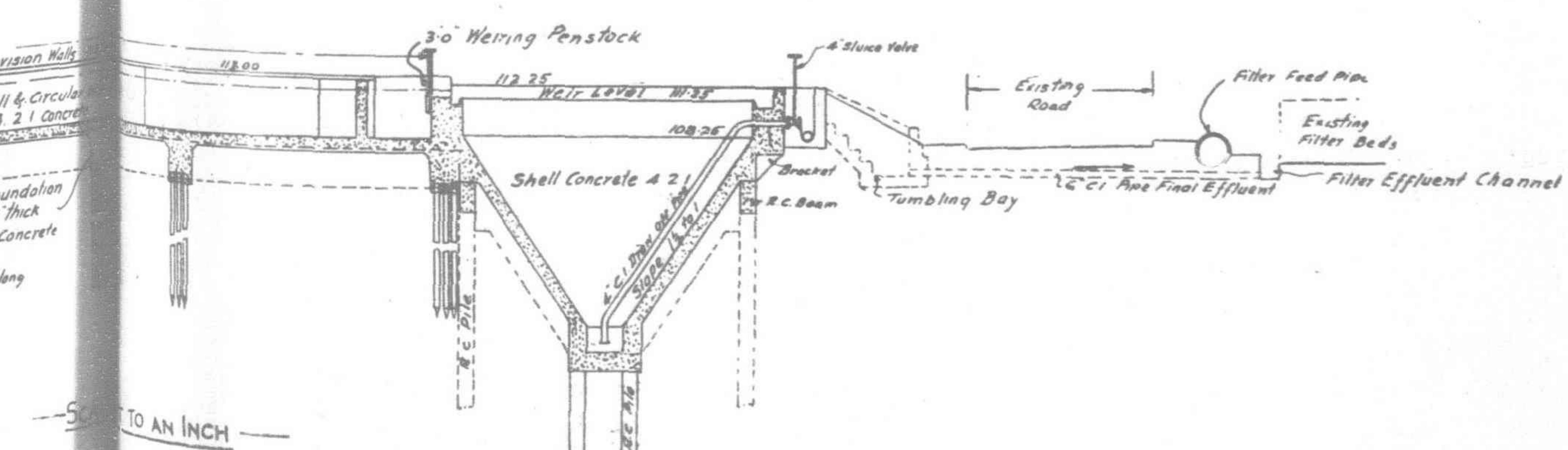
— TO TREAT 250,000 GALLONS PER DAY —



— PLAN —



— SECTION C-C —



— TO AN INCH —

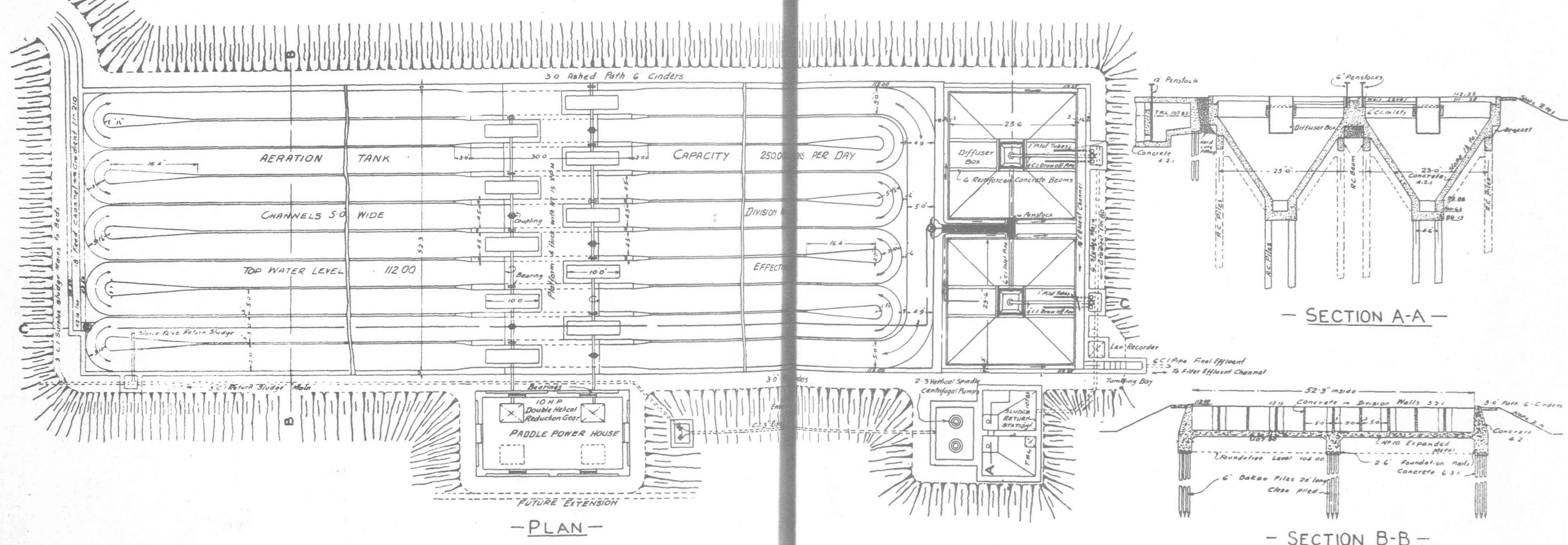
million gallons per day, so that there will be no cause for anxiety that Singapore's increased demand for water will not be met. The first instalment of the Johore scheme, from Gunong Pulai, will supplement present supplies by 6½ million gallons daily, this water flowing to Singapore by gravity. Five further instalments are located at Pontian Ketchil, which is situated on the Gunong, and they will provide 13½ million gallons daily when fully developed.

Thus, the Johore scheme naturally divides itself up into two parts—the Gunong Pulai project which is at present under construction; and the Pontian Ketchil scheme, the details of which are

at present under discussion. As has already been described on a previous occasion a large reservoir is being built at Gunong Pulai, capable of holding 1,200 million gallons of water, which will flow by gravity to the service reservoirs constructed or about to be constructed in Singapore.

The Pontian Ketchil Scheme

On the other hand, all the water which the Pontian Ketchil scheme renders available will have to be pumped to a height of 350 feet to a large tank at a point near the Gunong Pulai reservoir, whence it will also flow to Singapore by gravity. The 13½ million



— SECTION B-B —

gallons which this scheme will be capable of producing will not be required immediately, and at first pumps capable of dealing with 3 million gallons a day will be installed. As the need for further development arises the pumping capacity will be increased by the provision of pumps capable of dealing with further instalments each of 3 million gallons a day until the 13½ million gallons maximum is reached. These later instalments of the Johore scheme will necessitate the gradual duplication of the pipe-line from Pulai to Singapore, which is now approaching completion. This pipe-line will deal with 12 million gallons daily, and the necessity for the duplicate pipe-line will only commence when it becomes necessary to bring over more than 12 million gallons a day—which is not expected to occur before 1936.

It is anticipated that the first instalment of the Pontian Ketchil scheme will be pumped up by the end of 1931. Through the necessity of pumping this scheme will be comparatively expensive, and in wet years, in order to save the cost of pumping, it will be possible to draw most of the water required from the Gunong Pulai reservoir; but in dry years the Pontian Ketchil pumps will have to be used to their full capacity. The Pontian Ketchil reservoir will be a gigantic one, with a top water area of 2,500 acres, and impounding probably some 13,000 million gallons of water. (The present reservoirs in Singapore each have a top water area of roughly 250 acres).

Preparing for the Future.—Sewerage and Conservancy

Considerable attention is being paid by the Municipal Engineering Department to sewerage and conservancy matters. In regard to the former the pumping capacity of Peoples' Park Pumping Station is being increased by the installation of two extra Stereo-phagus Pumps driven by electric motors; these with the existing pumps will be sufficient to deal with all demands upon the station for some years to come. The substation in River Valley Road has been in commission for some time and that at Albert Street is nearing completion. Most of the main trunk sewers have been laid, and the sewerage to be done in the future will consist largely of sewers laid in back lanes. A considerable portion of China-town has been seweraged and sewer connections to the houses from the backlane branch sewers are being made rapidly. Similarly, the congested area bounded by Beach Road, Bras Basah Road, Selegie Road, and Rochore Canal will be dealt with as soon as the Albert Street Pumping Station is in commission, which will be early next year. There is not much chance of the residential areas, except those near River Valley Road, Orchard Road, and Bukit Timah Road, being connected to the Municipal sewers for some years, the policy of the Municipal authorities being to deal first with all congested areas. The Engineering Department is co-ordinating, so far as is possible, with the Building Department so that, where feasible, sewers are being laid for new building schemes.

With a view to avoiding the necessity of laying a deep level sewer along Jalan Sultan, Victoria Street and Rochore Road, a cast iron caisson has recently been sunk at the junction of North Bridge Road and Jalan Sultan for the purpose of accommodating a sewage ejector. This is essentially a pneumatic pump which works automatically by means of floats; as soon as the sump is filled with sewage to a certain level it turns on a switch, and the sewage is blown by means of compressed air to a higher level, into the shallow sewer leading to the Pumping Station.

Notable Advance

The sewerage system here is far more extensive than most people are aware of. Between two million and 2½ million gallons of sewage are pumped to the Disposal Works at Alexandra Road daily. After purification by means of Imhoff Tanks and Filter Beds, the effluent is discharged into the Singapore River. The effluent is purified to a degree above that required by the Royal Commission, and this is being improved upon.

Tenders are being invited for the construction of a 250,000 gallons per day unit for the treatment of raw sewage by Bio-Aeration, usually known as the Activated Sludge System, and it is proposed to follow the method of treatment evolved at Sheffield.

In connection with treatment of sewage by Bio-Aeration, it should be explained that the sewage system in Singapore is what is known as the separate system, which means that the greater part of rain and surface water is excluded from the sewers. This makes the problem of designing a Bio-Aeration Unit for Singapore some-

what difficult, in view of the fact that there are no precedents of similar systems elsewhere to copy.

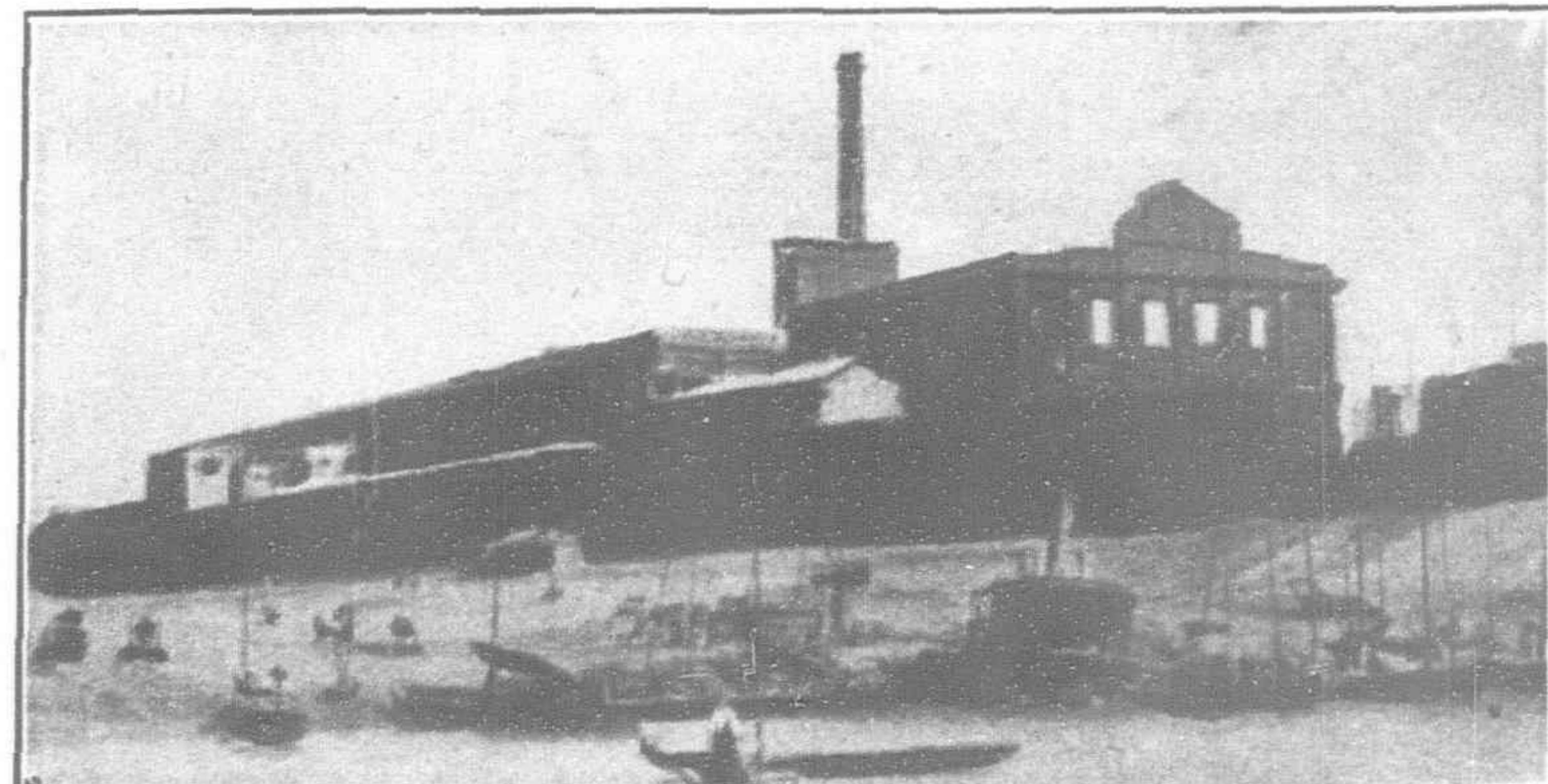
Considerable attention is being paid to the cleansing of the town and the removal of refuse, and a third unit has been added to the Heenan and Froude Incinerators at Alexandra Road (used for burning rubbish) which is now working very successfully. The incinerators at Jalan Besar are of an antiquated type and their replacement by up-to-date incinerators cannot be delayed for very long.

New Municipal Workshops

A contract has just been placed with Messrs. Gallinagh & Co. for the construction of the first series of new buildings to accommodate the Municipal Workshops. For many years the Workshops at River Valley Road have been run at a great disadvantage on account of the stone crushers being placed in close proximity to them. The stone crushers occupied a good deal of space, their vibration militated against good foundry work, whilst the clouds of dust which they gave out shortened the lives of lathes, motors, and other machinery. The crushers have now been removed to Mandai Quarry, where the crushing of the granite is done on the spot and the screening into various grades is done by gravity. The first block of new Workshop buildings will be of reinforced concrete and will cost about \$80,000. Designs and estimates are also complete for the proposed new Central Garage (to house and keep in repair the fleet of over 100 lorries owned by the Municipality) at Mackenzie Road, but funds for this work have not yet been voted.

Sulzer Steam Engine Plant in the Chen Huan Cotton Mill, Hankow (China).

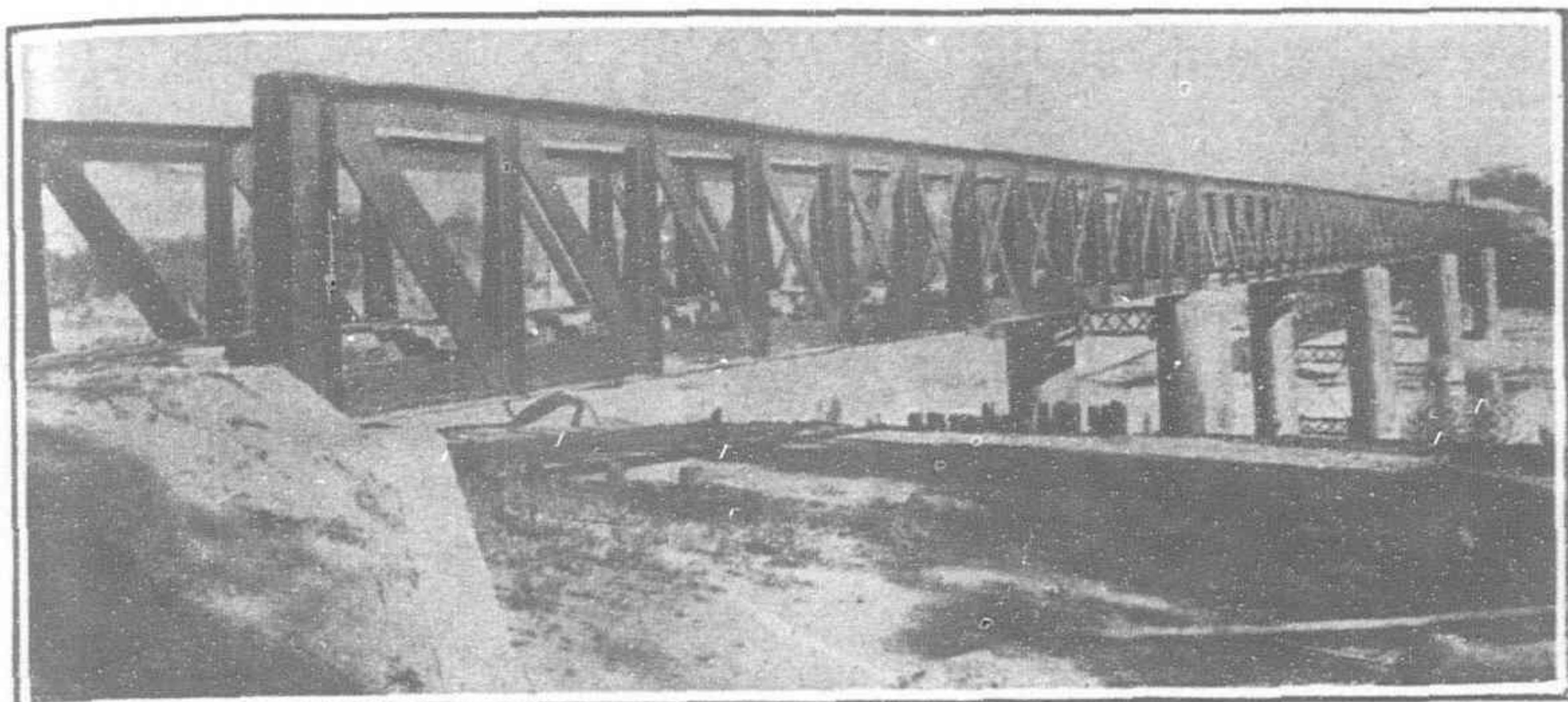
A 750 h.p. Sulzer uniflow steam engine has been put in service in the Chen Huan Cotton Mill at Hankow; it serves for driving the spinning frames and for lighting the mill. There are about 25,000 spindles in the mill, which are driven through shafting from the rope flywheel of the engine. The electric plant



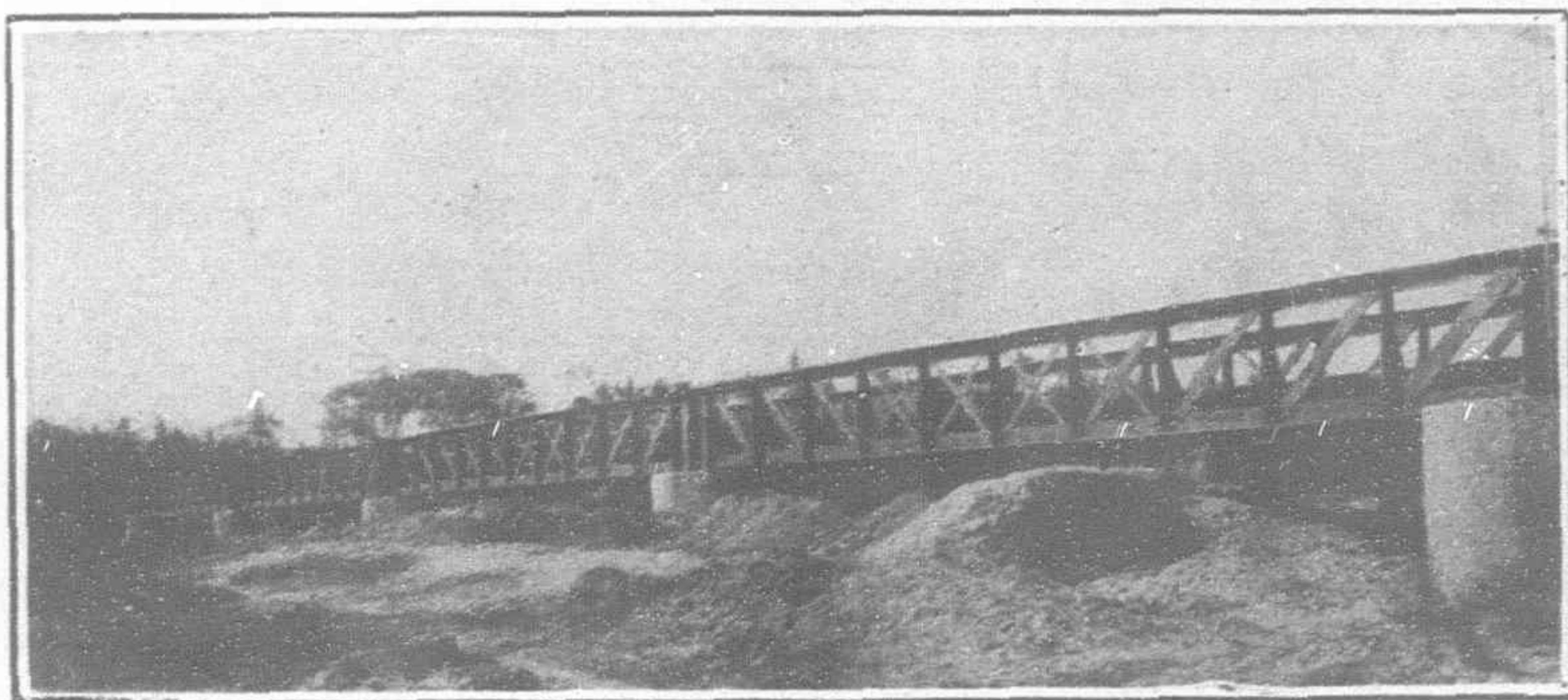
Chen Huan Cotton Mill, Wuchang (China)

consists of a 200 k.w. turbo-alternator, generating current at 400 volts which is also used for driving the pumps supplying water to the mill. The two pumps are movable, being fitted on small trucks on rails, since the level of the water in the Yangtze, from which the water is drawn, varies at Hankow by as much as 46-ft. According to the amount of water in the river, the pumps are near the building shown in Fig. 35 or down near the edge of the river.

In connection with the Sydney Suburban Railways Extension, The Westinghouse Brake & Saxby Signal Co., Ltd., have received an order from The Metropolitan Vickers Electrical Co., Ltd., for 101 Motor Driven Air Compressors Type DH.



Quingua Bridge Showing New 100-foot Through Span at North End of Bridge, Quingua, Bulacan, Km. 34.945 Cabanatuan Line



Five New 20-Meter Through Spans, South End of Agno River Bridge Near Bayambang, Pangasinan, Km. 163. Main Line North

Manila Railroad Company

THE year 1925 has been a satisfactory one in most respects. Both gross revenues and net income showed the largest figures as yet recorded by the Manila Railroad Company, March operating revenues of P.1,300,077.31 being the highest for any single month in its history. The railroad by expanding its facilities and improving its plant has been able to keep pace with the economic development of the territory it serves and has been no small factor in assisting in and contributing toward such development.

However, it should not be inferred that because the 1925 earnings were equal to or greater than during former years they were necessarily excessive, the truth being that the net operating income of the Company has been and still is disproportionately low to the total amount of its investments. The impression seems to have gained currency that the company is now enjoying greater prosperity than is strictly warranted by prevailing conditions and that the rates charged for transportation service should be drastically reduced. On the other hand, it should be remembered that the Government of the Philippine Islands has received no return whatever in the shape of dividends on its investment, as all surplus earnings have had to be used to liquidate past indebtedness and to finance the necessary and essential improvement of the property.

Furthermore, it would not be fair to draw conclusions from one single year's operations, which, like the year 1925, was one of the best years that the company has ever had. The reasonableness of the Company's rates can only be determined by taking into consideration the average net income over a period of at least five years, so that in fairness to the company it can be reimbursed during good years for the deficiencies sustained during lean years.

Consequently, it is believed that the company should not be required to put into effect rate reductions to such an extent as to seriously curtail revenues and make it impossible to earn anything approaching a fair return on the investment. However, a gradual modification of the rate structure, both passenger and freight, is now being carried out. This revision has for its basis the consideration of each traffic item on its merits, both singly and in relation to the general rate structure, and only making such

reductions as will still allow the company to earn a reasonable amount on the business handled.

General prosperity in the territory served by the company characterized the year 1925. Good crops at normal prices, except possibly as to sugar, resulted in an active movement of staple products to the mills and to the Manila district, and heavy shipments of manufactures and building materials to the provinces. Competition for short haul business by truck operators in the Central Luzon district continued to be very keen. However, the company has been able to secure a fair share of the increased traffic occasioned by the general increase in production and resulting prosperity.

The heavy production of sugar cane and the great improvement in the 1925 rice crop caused a very marked increase in tonnage of sugar cane, sugar, rice, and palay. Building operations in the

provinces reached by the railroad far exceeded those of 1924 and resulted in increased shipments of lumber and other building materials. Rate concessions in the way of reduced fares for round-trip tickets, a reduction in the passenger rates on the Legaspi Division, and the inauguration of kilometrage books and special 10-party tickets proved successful in stimulating passenger traffic and increasing passenger earnings.

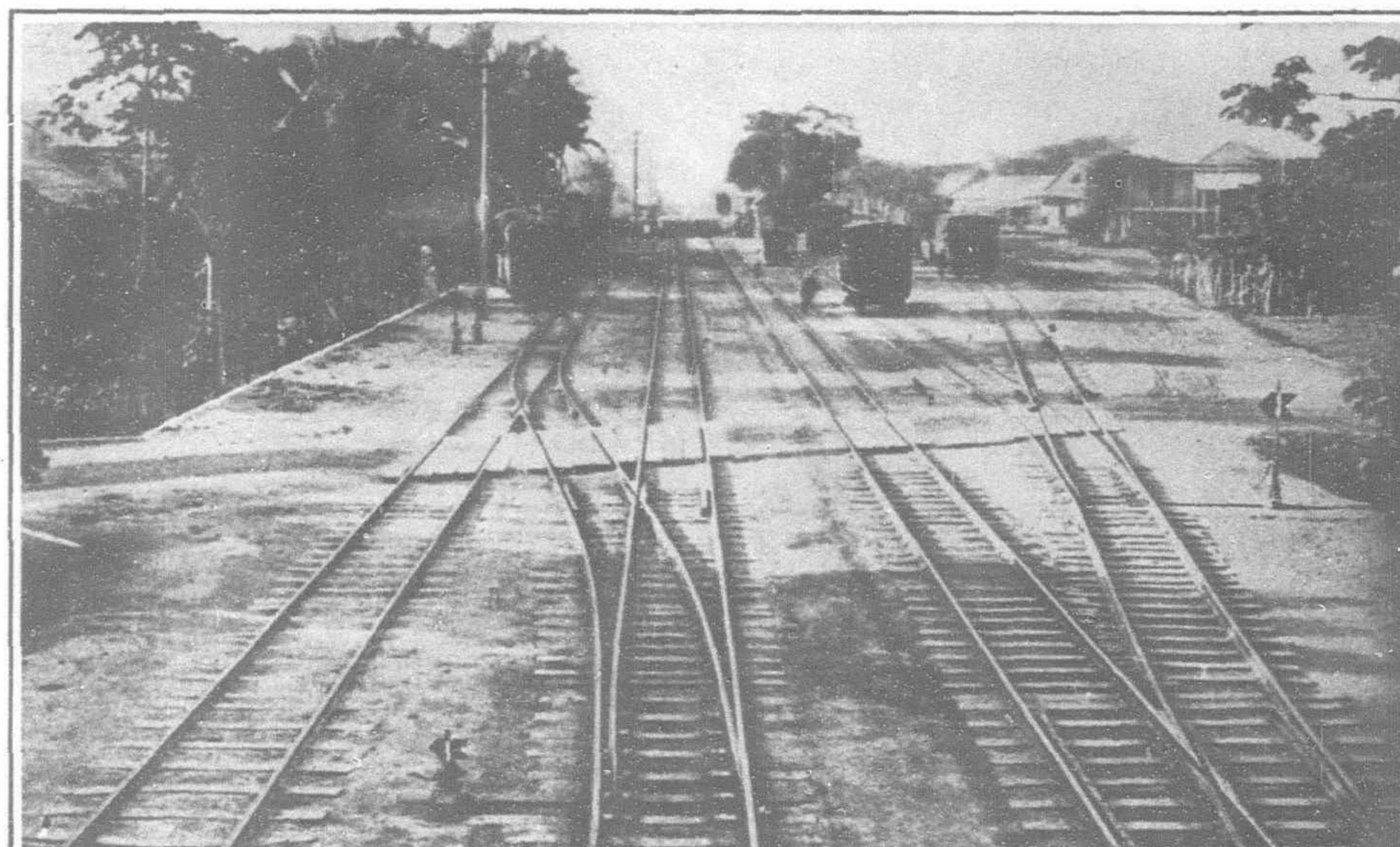
Railway Construction

During 1924, as stated in the report for that year, the extensive construction work in connection with grade

Paco and Sucat, Main Line South, was practically completed. This work was entirely completed during the first two months of 1925, at a total cost of P.270,708.61. The original appropriation was for P.320,000.

On January 9, 1925, the Board of Directors made the following appropriation :

1. For the extension of the Agno River railroad bridge near Bayambang (Main Line North), including the acquisition of the necessary land	P.116,000.00
2. For the raising of the track and existing bridges between Paniqui and Bayambang (Main Line North)	257,000.00
Total	373,000.00



Paniqui Station Layout—View from North End of Yard, Paniqui, Tarlac, Main Line North

The above is the only extensive construction project undertaken during 1925. For many years this section of the Main Line North has been subject to inundation and interruption of traffic during the rainy season. A conservative estimate of traffic losses due to interruptions of operation in this locality during the years 1919, 1920, 1921, and 1923 is P.256,000. This does not include the cost of river protection works at Bautista and the cost of repairing the washouts between Paniqui and Bayambang which amounted to approximately P.160,000 for the period 1919 to 1923. To avoid frequent interruption of traffic and the resulting losses of revenues to the Company, as well as to remove the constant danger of the railroad line being cut at Bautista, it was decided to undertake and carry to completion a plan designed to permanently solve this problem. This work naturally falls under two main divisions :

1. Widening the channel of the Agno River in the vicinity of the railroad bridge, and adding 100 meters to the length of the bridge by the construction of five additional 20-meter steel thru spans.

River control work accomplished by the Insular Government, part of the expense of which has been borne by the Manila Railroad Company, will cause a much greater proportion of the Agno River flow to be confined within its own banks than formerly was the case. The widening of the channel near the railroad bridge and the lengthening of the bridge were therefore necessary to take care of this increased flow of water.

2. Raising the level of the railroad track between Paniqui and Bayambang 50 centimeters above the highest flood level that was observed in 1919; i.e., from Km. 140.5 near Paniqui to Km. 145.8, a distance of 5.3 kilometers, an average raise of .40 of 1 meter; from Km. 148.2 near Moncada to Km. 163 near Bayambang, a distance of 14.8 kilometers, a raise of from $\frac{1}{2}$ to 1 meter.

This work will require about 400,000 cubic meters to fill and when completed should enable the Company to maintain uninterrupted traffic over this section during the rainy season.

During the progress of this work last July (1925) the center of a violent typhoon passed almost directly over this region, accompanied by extremely heavy precipitation. This flood has been referred to previously in this report. The rapid rising of the Agno following this storm converted the entire district between Moncada (Km. 147) and Bautista (Km. 161) into a vast lake and the track was under water at different points for distances aggregating several kilometers. At that time the fill work was only partially completed and but for the raising of the track already accomplished the damage would have been much more extensive and the interruption of traffic much longer than the one week required to repair the breaks in the line.

On December 31, 1925, the work of track elevation had been about 80 per cent. completed and the entire project will probably be finished before the beginning of the rainy season of 1926.

Tondo foreshore reclamation.—The foreshore area to be reclaimed between the pile trestle and the old Manila Bay front comprises almost exactly 100,000 square meters. Of this, about 20 per cent. was filled up to the level of the adjacent streets during the year, leaving approximately 80,000 square meters yet to be filled. This work has been done entirely with material hauled in over the railroad on flat cars, which is necessarily a slow process. It had been expected that the work would be done by the use of a suction dredge, which, however, was not available for railroad use during 1925, but will be available during the early part of 1926.

The filling already accomplished has enabled the track leading to Calle Del Pan and the Murallon on the Pasig River to be relocated near the edge of the filled area. In addition, a substantial stone and concrete wall, 463 meters in length, has been erected, delimiting the eastern boundary of the railroad foreshore property.

Additions and Betterments

The yard trackage at the following stations was increased a total of 1,770 meters as indicated below:

					Meters
Paniqui	..	..	..	..	1,062.00
Lucena	..	..	..	..	526.00
Calamba	..	..	..	..	182.00
Total	..	..	..	..	1,770.00

During the year 1925, sixteen (16) industrial spur tracks (6 in 1924) were constructed as follows:

	Meters
Km. 69.631 Arayat Line, Pampanga Sugar Mills ..	68.50
Km. 90.197 Magalang Line, Pampanga Sugar Mills ..	23.20
Km. 85.750 Stotsenburg Line, Pampanga Sugar Mills ..	59.30
Km. 88.170 Floridablanca Line, Pampanga Sugar Mills ..	80.00
Km. 82.118 Floridablanca Line, Pampanga Sugar Mills ..	109.26
Km. 114.636 Main Line North, Pampanga Sugar Mills ..	86.25
Km. 120.777 Main Line North, Pampanga Sugar Mills ..	92.50
Km. 73.322 Arayat Line, Pampanga Sugar Development Co.	52.45
Km. 71.202 San Pablo Cut-Off, Calamba Sugar Estate ..	116.31
Km. Masaya Station, Cut-Off, Calamba Sugar Estate ..	125.00
Km. 72.430 San Pablo Cut-Off, Calamba Sugar Estate ..	50.00
Km. 53.950 Canlubang Line, Calamba Sugar Estate ..	57.00
Km. 111.349 Main Line North, Compañia Tabacalera ..	67.86
Km. Alaminos, Main Line South, Calauan Estate ..	186.00
Km. 121.798 Main Line North, First Luzon Farmers Ass..	56.00
Km. 70.100 Laguna Line, D. Ordoveza ..	153.50

Ten (10) steel bridges with concrete abutments and a total length of 945 feet (620 feet for 1924) were constructed at the following places :

Km. 34.945 Cabanatuan Line	..	One 100-foot thru span.
Km. 55.478 Cabanatuan Line	..	Two 12-meter thru spans.
Km. 90.183 Laguna Line	..	One 8-meter thru span.
Km. 94.053 Laguna Line	..	One 8-meter thru span.
Km. 95.344 Laguna Line	..	One 12-meter thru span.
Km. 102.145 Laguna Line	..	One 10-meter deck span.
Km. 59.605 Main Line North	..	One 61-foot thru span.
Km. 163.021 Main Line North	..	Five 71.5-foot thru spans
Km. 227.965 Main Line North	..	One 30-foot thru span.
Km. 142.717 Tayug Line	..	Five 16-meter thru spans.

Recommendations

Additions and betterments.—Substantial progress has been made during the past year toward the carrying out of the following improvements mentioned in the recommendations contained in the report for 1924:

- A. Raising of the road-bed above flood elevation and grade rectification.
 - B. Installation of additional siding facilities at stations.
 - C. Replacement of wooden bridges with permanent steel and concrete structures.

Other projects that should receive early attention are as follows:

- D. Manila terminal improvements :
 - 1. Extension of Manila station train shed.
 - 2. Construction of an incoming freight shed.
 - 3. Construction of a coach cleaning shed.
 - E. Relaying of Floridablanca Branch and Canlubang Branch with 65-lb. rail. Very heavy sugar cane and sugar traffic is handled over these lines during the milling season, and the present 45-lb. rail is too old and light to stand up under present conditions.
 - F. Acquisition of new rolling stock to properly accommodate the growing traffic and furnish more efficient service.

In connection with the last item and as recommended in a former report, the acquisition of one or two motor or steam single unit coaches for use on branch lines or for more frequent service for short distances on main lines is considered to be an expenditure that would be justified. Practical operation of one or two units would then form some criteria for future expansion of this type of service.

Obtaining franchise for construction of Tarlac-San Jose Line.— As mentioned in the report for 1924, the survey for a branch line from Tarlac, Tarlac, to San Jose, Nueva Ecija, was completed during that year. However, no further steps have been taken in connection with this tentative project, and it is recommended that whatever action may be necessary be taken toward securing a special franchise from the Government of the Philippine Islands looking to the eventual construction of such a line. Previously contemplated new construction, such as the Aloneros-Pamplona connecting line and the extension of the Main Line North from Bauang Sur to San Fernando, La Union, is already included in the present franchise of the Company.

Construction of Undersea Railway Tunnel

Between Shimonoseki and Moji To Begin in 1928

THE Department of Railway of the Japanese Imperial Government has decided to commence the construction work of the proposed undersea railway tunnel between Shimonoseki and Moji, which will be about 6 miles long, in the fiscal year 1928-9 to be completed in about 1923.

How to connect Shimonoseki and Moji directly by railway has long been a pending problem of the Railway Office. In 1911, the office entrusted Dr. Hiroi to make investigations with the object in view of connecting the two cities by spanning an iron bridge across the sea. Meantime, Dr. Okano drafted a plan of connecting the two cities by building an undersea railway tunnel. The Railway Office, after comparative study of the two plans, decided to adopt Dr. Okano's undersea tunnel plan.

In the 41st session of the Imperial Diet in 1918, the Railway Department introduced a bill for an appropriation of Y18,000,000 to cover the cost of construction of the undersea tunnel. It was proposed that the appropriation should spread over 10 years beginning in the fiscal year of 1919-20. The proposal was approved, and geological survey commenced accordingly.

In 1924, it was found necessary that Dr. Okano's plan should be revised. The appropriation of Y18,000,000 spreading over 10 years was cancelled, as a result, and the Moji Railway Bureau and the Shimonoseki Railway Improvement office jointly worked on the revised plan.

The revised plan having been completed, a special meeting was held on September 8, 1926, at the official residence of Railway Minister Viscount Inoue in order to give final consideration on this revised plan, and thus it was definitely approved.

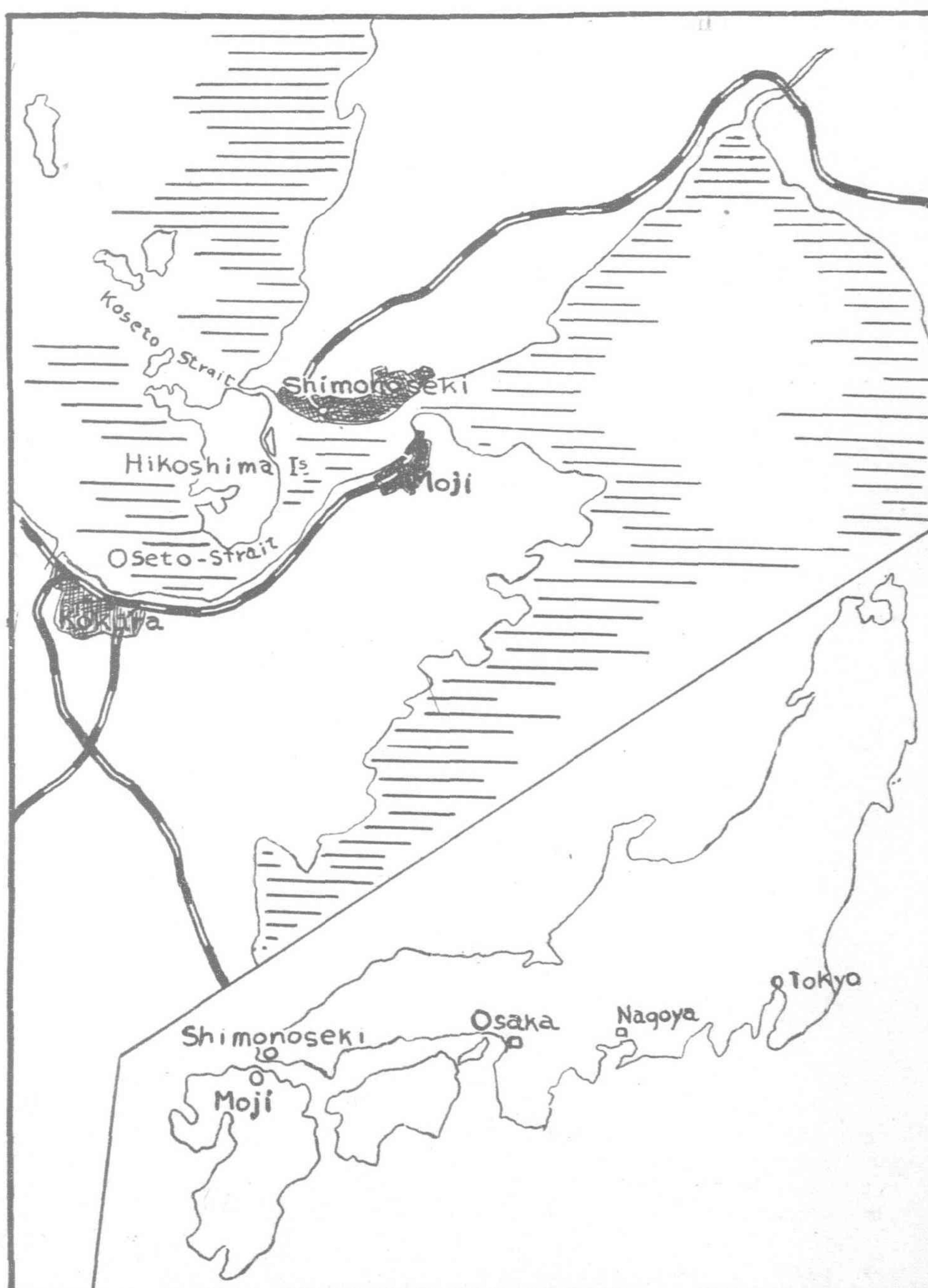
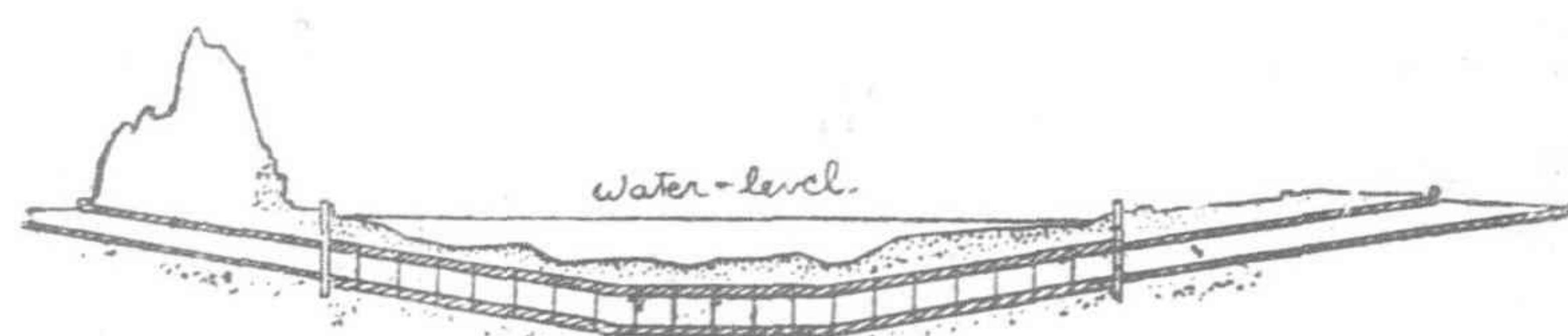
Details of the construction work of the proposed undersea railway tunnel will be decided on in the course of the next fiscal year, following actual survey and after consultation with other government departments concerned.

Undersea Tunnel Plan

It is proposed that the projected line should rise at Hatau on the Shimonoseki side, cross Koseto or Seto strait minor by iron bridge, run through Hikoshima island, and cross Oseto or Seto strait major by undersea railway tunnel and join the trunk railway line in Kyushu.

It appears that there are still divergent opinions as to what kind of undersea railway system should be adopted. At present, the officials are studying two systems, viz., the tube and the underground tunnel of "Sealed" system.

It is estimated that the sealed tunnel with double track would cost about Y32,000,000 and Y20,000,000 for the tube. For the next fiscal year, the Railway Department will ask for an appropriation necessary to cover the cost of investigation expenditure on the project.



The Proposed Undersea Railway Tunnel

Latest Oster Catalogue

The latest catalogue of The Oster Mfg. Co. is now available for general distribution. Oster manufactures the most complete line of pipe threading equipment in the world. The new catalogue is complete in every detail and includes such new additions to the Oster line as the quick acting vise, and the special type reamer and

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Express Locomotives with Individual Axle Drive for the Dutch East Indies

I.—Introduction

OST of the narrow gauge railways in Europe are local lines on which the running speeds are less than those of the main lines and the train weights are comparatively small. The narrow gauge is adopted in order to effect a saving on the initial outlay where only little traffic is concerned, or where difficult topographical conditions are encountered, as on mountain railways ; or again for the connections to main, but not international lines. The same or similar reasons may apply to the construction of narrow gauge lines overseas, as they are frequently employed in South Africa, India and Japan. The most extensively used gauge, known as the Cape gauge, is 3-ft. 6-ins. (1,067 mm). The traffic on the oversea narrow gauge lines, which often constitute main lines and state railways, has grown considerably during the last decade, so that the train weights and speeds required have been increased until they are scarcely inferior to those of the European main lines. On the electrified sections of the Japanese Government Railways the trailing load for fast trains in 450 tons, and that for goods trains 800 tons, while express trains attain a speed of more than 90 km/h. On narrow gauge lines the space available in the locomotive is naturally limited. On such railways, curves are frequent, and the radius of curvature is usually small. The allowable axle load is limited to a maximum of 15 tons ; in South Africa it is 18 tons. Difficult climatic conditions are often encountered and attendance and maintenance are frequently performed by an unskilled staff. When building locomotives for these conditions, requiring transport of the greatest weights at the highest possible speed, the individual axle drive developed by Brown, Boveri & Co., offers special advantages. Indeed, for transmission problems it constitutes the best solution at present on the market, as it enables an absolutely uniform transmission of the torque to the driving wheel (which is free vertically, radially, and laterally) to be obtained at all motor speeds. All shocks, vibrations and oscillations are entirely avoided. Further, it allows motors of a larger output to be fitted to a given pair of wheels. None of the space required by the motor is occupied by gears, hollow shaft and bearings, or other parts of the transmission system. By these means more than sufficient space can be obtained between the frames, and the frames themselves are not cut or weakened by fitting jack shafts.

Owing to the position of the motors, the centre of gravity of the vehicle is higher than with the tram-type of drive. The running characteristics especially when on curves, are therefore particularly favourable.

The weights of drive and of the locomotive are less than those of machines with rod drives, and, on account of the length of the locomotive being reduced, smaller than those of a vehicle driven by tram-type motors.

The individual axle drive requires no exact adjustment as is necessary for example, with parallel cranks. Wheels with worn tyres, and consequently with tread circles of various diameters, may be used without difficulty on a locomotive of this kind.

Automatic lubrication is provided for these locomotives, but very little oil is consumed by the drive. The pony axle and the driving axle are connected as in the well-known Krauss-Helmholtz truck.

These considerations may well have been the deciding factors in inducing the Administration of the Dutch East Indies State Railways to order two locomotives for their narrow gauge system in Java. They are the first narrow gauge locomotives to be fitted with the Brown Boveri individual axle drive. In 1916-7 a complete electrification programme was prepared by the hydro-electric power supply authorities in Java. The railways in and about Batavia as well as the section between Batavia and Buitenzorg and if necessary the branch line to Soekaboemi and also the main line from Batavia to Tjikampek were to be electrified. The scheme involved the construction of two large power stations on the Tjitjatih and Tjianten ; these were named the Oebroeg and Kratjak Power Stations. Three-phase power at 50 cycles is generated, and is supplied at 70,000 V to the State Railway Sub-stations at Buitenzorg, Depok, Meester-Cornelis and Antjol. In these sub-stations the pressure is stepped down to 6,000 V, and the distribution for lighting and power is carried out as well as conversion of the power into direct current at 1,500 V for traction purposes. The programme was commenced in 1920 when constructional work was started at the power stations. Owing to general economic troubles at this time the scheme was restricted. Work was stopped on the Kratjak Power Station, and the work on the line around Batavia limited. The following sections were electrified :—Meester Cornelis-Passar Senen-Priok, Priok-Batavia, Batavia-Passar Senen, Batavia-Weltevreden-Manggarai-Meester Cornelis. The first of these sections was finished during the early part of 1925. The total length of all the sections is about 120 km of single track. The electrification of the branch lines to Buitenzorg and Tjikampek was postponed for the time being.

The sub-stations at Meester Cornelis and Antjol were the only ones built, but these also were ready for service in January, 1925. Each of these sub-stations is equipped with two rotary converters having continuous outputs of 1,500 kw. and overload capacities of 100 per cent. for two minutes.

At present 15 motor coaches and seven locomotives are on order, and Brown, Boveri & Co. are to supply two of the locomotives. The locomotives were to be constructed with a view to subsequent extension of the electrification on the main lines.

The Meester Cornelis-Tandjong Priok Section was the first electrified service to run. On April 6, 1925, this line was opened ; Brown Boveri locomotives, the mechanical part of which was supplied by the Swiss Locomotive and Machine Works of Winterthur, were used.

II.—General Particulars of the Locomotives

Gauge, 1,067 mm ; Energy supplied, Direct current ; Contact-wire pressure, maximum, 1,575 V ; Contact-wire pressure, mean, 1,350

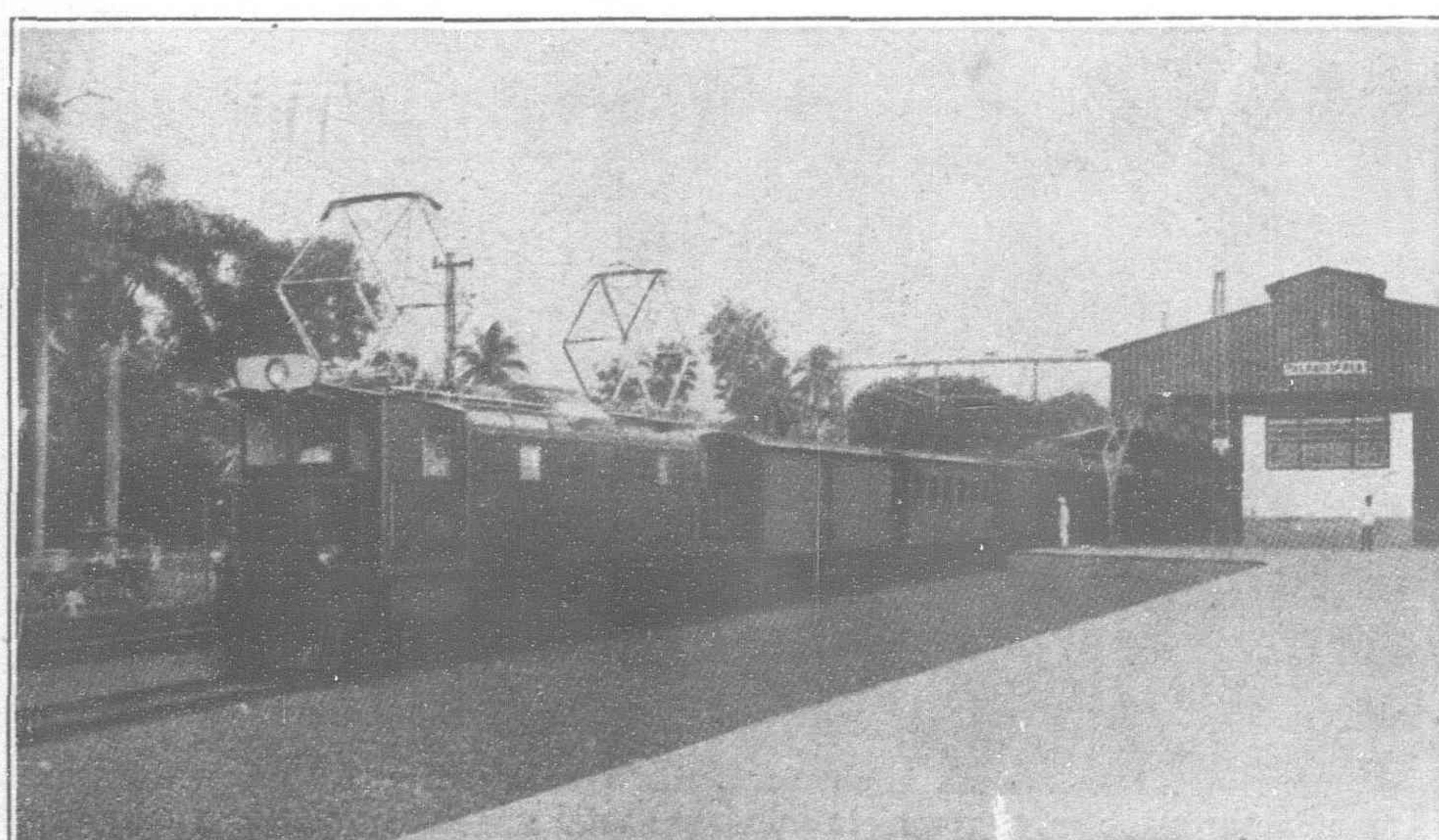


Fig. 1.—Passenger Train with Brown Boveri Locomotive Leaving Passar Senen

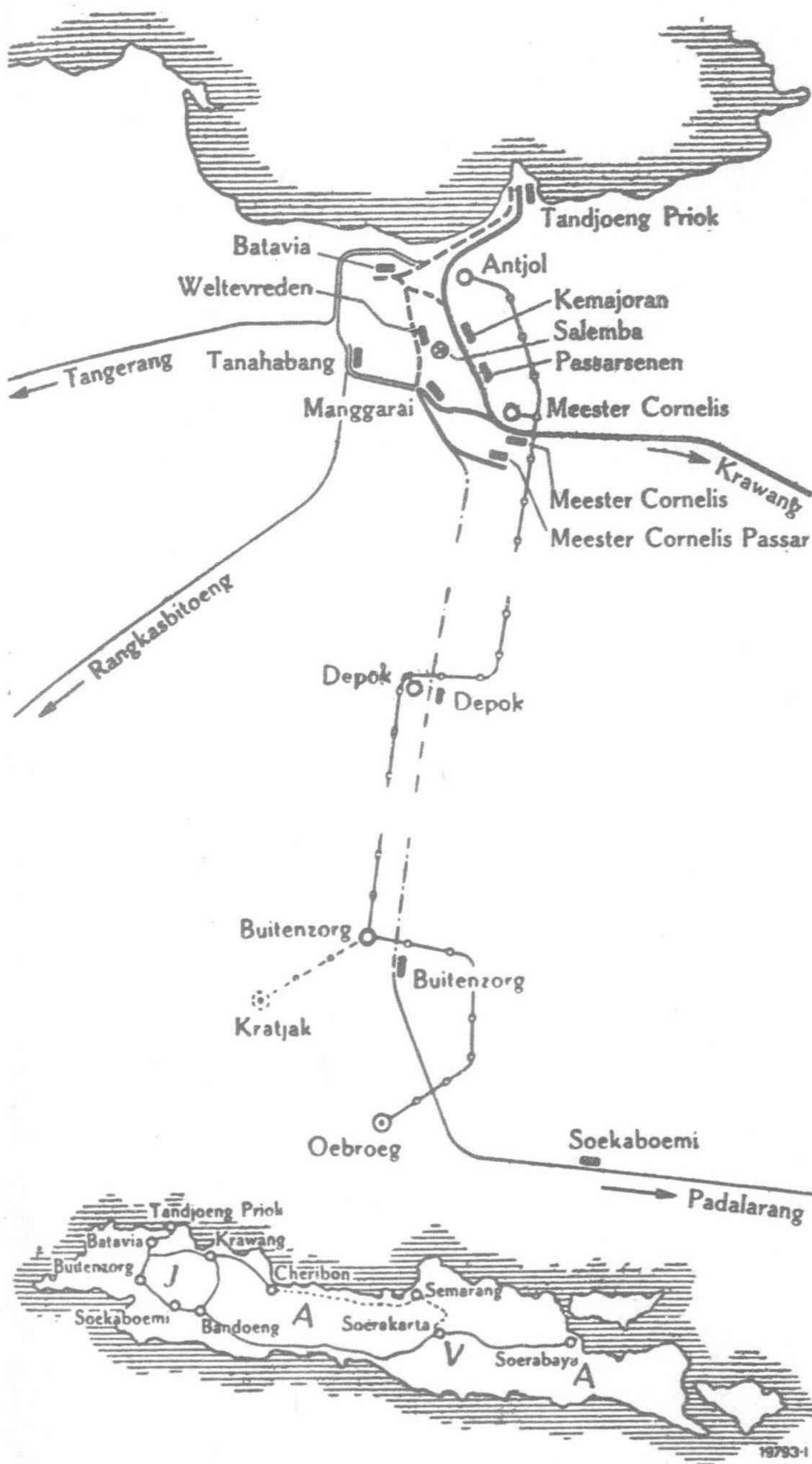


Fig. 2.—Main Lines of the Dutch East Indies State Railways, Showing Sections Already Electrified and those to be Converted Shortly

- Electrified.
- Electrified decided.
- ... Electrification projected.
- Steam-operated single line.
- Steam-operated double line.
- o- High-tension transmission, three-phase current at 66kV.
- ⊕ Steam power station
- Hydro-electric power station in service.
- Projected hydro-electric power station.
- Substation.
- Railway station.

V; Contact-wire pressure, minimum, 1,275 V; Maximum speed, 90 km/h; Overspeed test (equivalent speed), 105 km/h; Load on driving axle, 13 tons; Load on pony axle, 9 tons; Wheelbase' total, 8,960 mm; Wheelbase' fixed, 1,800 mm; Wheelbase of the bogies, 2,000 mm; Driving wheel diameter, 1,500 mm; Pony wheel diameter, 777 mm; Height of contact-wire, maximum, 6,000 mm; Height of contact wire, minimum, 4,100 mm; Reduction gear ratio, 2.79 : 1; Minimum radius of curvature on open sections, 150 m; Minimum radius of curvature at junctions, 140 m;

With a contact-wire pressure of 1,350 volts and a train resistance of 6 kg/ton the following outputs must be developed:—

Tailing load in tons	Gradient per cent	Speed km/h	Motor field	Tractive effort at tread of the wheel in tons
300	..	0	full	2.2
300	..	1.0	full	5.9
300	..	1.0	weakened	5.9

The locomotives are fitted with four motors which according to the specification of the A.I.E.E. have the following outputs at the shaft when cooled with 60 M 3 of air per minute:—

Pressure at terminals V	Output kw.	Speed r.p.m.	Torque mkg
One hour rating with full field ..	1,350/2	275	550
With weakened field ..	1,350/2	275	630
Continuous rating with full field ..	1,350/2	220	610
With weakened field ..	1,350/2	220	720

The output of the locomotive at the tread of the wheels with a contact-wire pressure of 1,350 V and 6.0 per cent. loss between the motor shafts and the rails is:—

Tractive effort Output H. P.	Speed at tread of H. P. km/h	wheel in tons
One-hour rating with full field 1,410	55.5	6.9
With weakened field .. 1,410	63.5	6.0
Continuous rating with full field 1,130	61.5	5.0
With weakened field .. 1,130	72.5	4.2

With an adhesion coefficient of 1:5 and a train resistance of 4.5 kg/ton, with a 5.0 per cent. increase for the rotating masses, a locomotive drawing 300 tons on the level must have an acceleration of 0.22 m/sec² until a speed of about 50 km/h has been attained.

The maximum tractive efforts at starting are:—

Adhesion coefficient	Tractive effort at tread tons
1 : 5	10.4
1 : 4.5	11.6
1 : 4	13.0

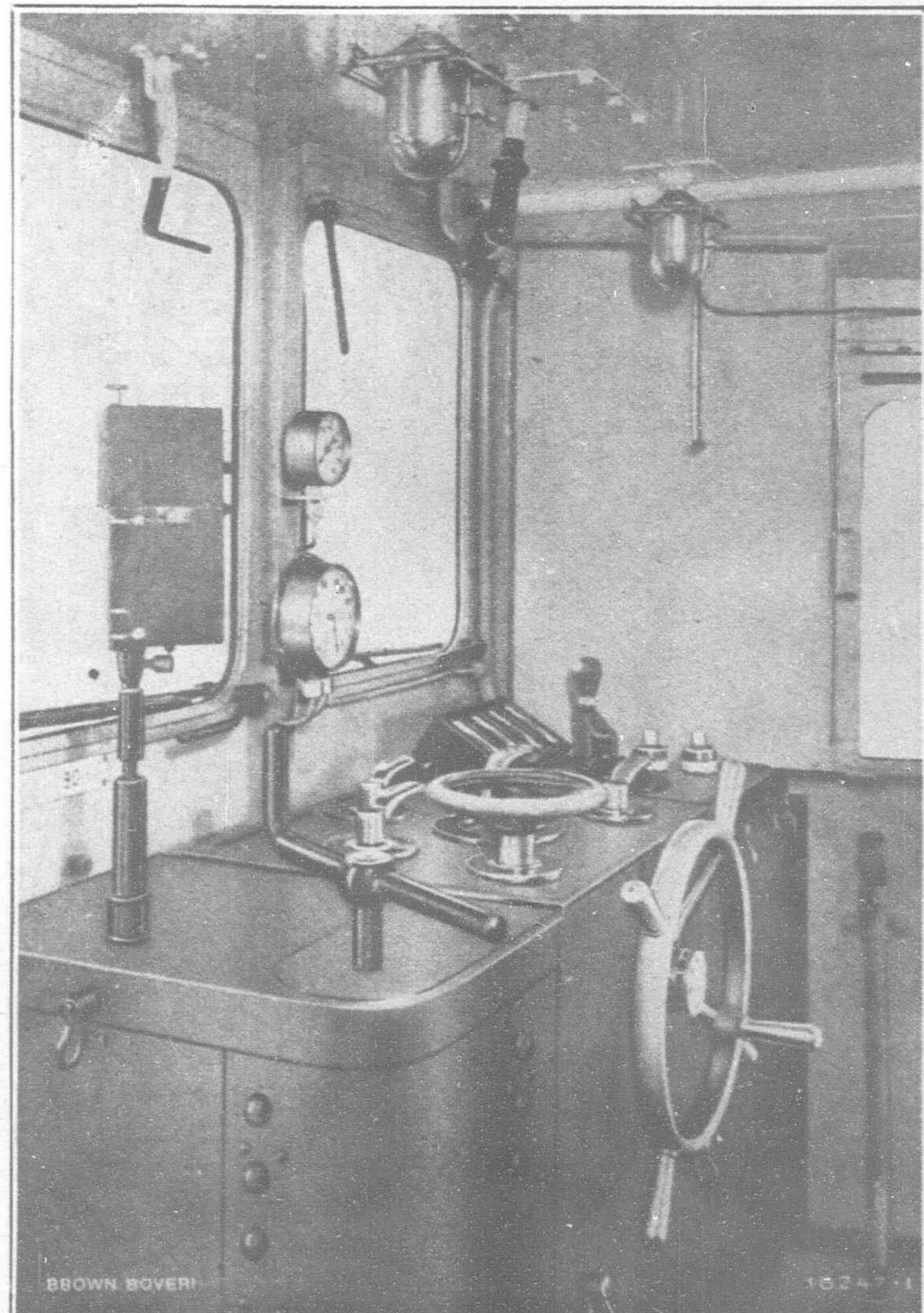


Fig. 3.—The Interior of the Cab of a Brown Boveri Locomotive

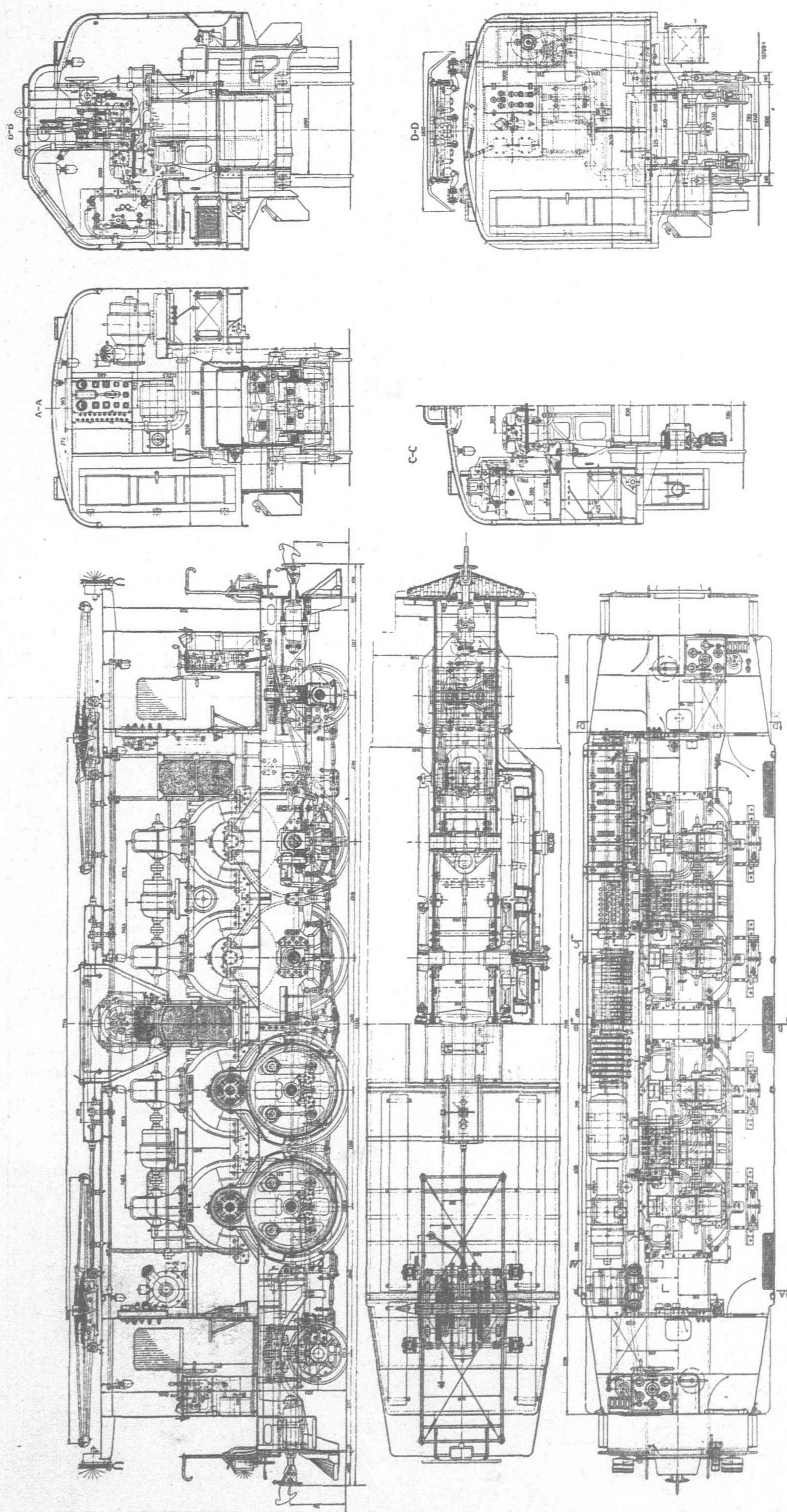


Fig. 5.—General Arrangement of 1 D 1 Locomotive with Brown Boveri Individual Axle Drive, for the Dutch East Indies
(The Mechanical Parts were made by the Swiss Locomotive and Machine Works Winterthur)

III.—Mechanical Part

The middle two driving axles are rigidly secured in the frame, and the outer axles with the pony axles are each mounted on a bogie. The pivot of the bogie is not between the two axles but is fitted immediately behind the driving axle. A threaded cone secures the bogie to a cast steel connecting piece on the frame. A ball joint cast on to the double axle-boxes of the outer driving axle secures the bogie to this pivot. Within certain limits the bogie may move as a whole round the pivot. The frame plates on the bogie are bolted to the inner side of the double axle-boxes of the driving axles, and to the outside of the guiding member for the bearings of the pony axle. The underframe rests on the bogies at three points, viz. the central support with ball bearing plate and also the leaf springs on both sides of the double axle-boxes of the outer driving axles. A bogie of this type gives a smaller striking angle of the movable pony axle at curves than with the Krauss-Helmholtz bogie, since the driving axle does not move parallel to the frame, but can move round the pivot. As a direct result, the following advantages are obtained:—Curves may be traversed better, the wear on the tyres of the driving wheels is less, and maintenance costs are reduced. This is the first application of this type of bogie (patented by Brown, Boveri & Co.) and it has, up to the present, given complete satisfaction.¹

The ball support on the guiding member of the pony axle is so constructed that lateral movements of the guiding member with respect to the pivot are possible *i.e.*, the pivot and its plate slide on the guiding member. The support is connected to the locomotive frame, and two links fitted to the frame secure it in a vertical direction. These links also transmit the centring force of the bogie to the locomotive. The greatest displacement of the pony axles compared with the longitudinal axis of the locomotive amounts to 2 by 70 mm. Leaf springs are used for centring; the initial tension of the springs is 1,300 kg. and a returning force of 2,900 kg is exerted when the maximum displacement of the bogie occurs.

The four motors are mounted in the main frame of the locomotive, and each drives the axle situated below it. The power is transmitted by means of a spring pinion which is mounted overhung and meshes with a large gear wheel. The bearing of this pinion

is fitted into a cast steel block on the auxiliary frame of the locomotive. The torque is transmitted from the gear wheel to the driving wheel by means of a link mechanism which consists of two toothed segments and two coupled rods. The coupled rods have special bearings, in order to allow movement between the driving wheel and locomotive frame when taking curves. All the mechanical parts are automatically lubricated and an oil pump is fitted for this purpose.

The transmission mechanism is completely protected by means of an oil bath made of sheet iron and cast iron. The pinion is sprung on the method patented by the Swiss Locomotive Works, Winterthur. The pinion hub is made of steel and mounted on a cone, threaded on and keyed to the motor shaft. The toothed rim of the pinion is forged from Siemens-Martin steel and is secured to the hub by phosphor bronze rings in such a way that it can be rotated. Movement of the hub is transmitted to the toothed rim by means of a forged lever and spiral springs.

The locomotive body may be divided into three main parts *i.e.*, the motor compartment and the two cabs. The side walls of the motor compartment are made in sections which may be taken apart for transport, and for the same reason the roof is also made in three sections. The two cabs are built up by riveting the roof and walls together and bolting to the floor plates. A double roof is provided for each cab. An adjustable flap is fitted to the front of the cab and thus a close-mesh gauze on the wall of the motor compartment, enables the space between the two roofs to be used for ventilation purposes. The ventilator in the roof may be closed during rain and helps to protect the drivers from the heat of the tropical sun. The two ends of the motor compartment are also provided with double roofs separated by 20 mm for ventilation purposes. The middle portion of the roof forms a rigid support for the main switch. The middle part of the frame work of the motor compartment acts as a platform on which the electrical equipment is mounted. All motors, auxiliary machines, and apparatus are secured to this framework; the storage battery and the reservoirs for vacuum and compressed air are fitted underneath at the sides of the locomotive body. The

pipe to the current collector includes a cock, the key of which normally points to "open." In order to remove the key, the cock must be closed. The compressed air pipe is opened when the cock is closed, thus lowering the current collector. The doors of the high tension-chamber can then be opened by means of this key. As long as the doors are open it is not possible to remove the key from the lock or to raise the current collector. Two isolating switches are mounted on the removable portion of the roof; these form an additional protection, and are in the conductors between the current collectors and the main switch. The operating spindles extend through the roof of the locomotive. A defective current collector may be cut out by its isolating switch. Both isolating switches must be opened before the high-tension room may be entered for carrying out an inspection or a repair. All leads from the collectors are thus interrupted and therefore not under tension; the only exception is the lead from the battery which is not at a dangerous potential. The

(Continued on page 495).

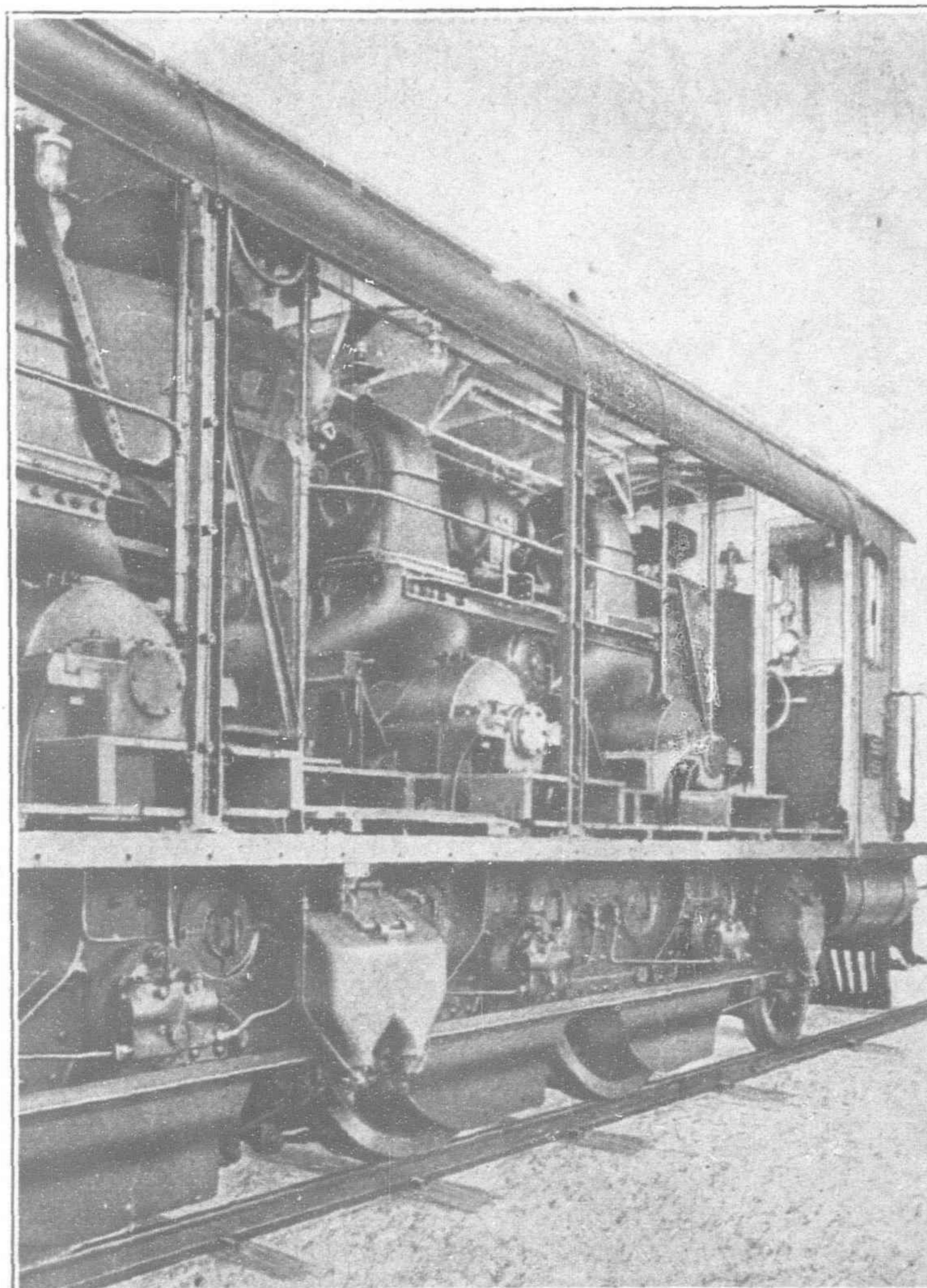


Fig. 4.—Locomotive with Side Panels Removed, Showing Machinery

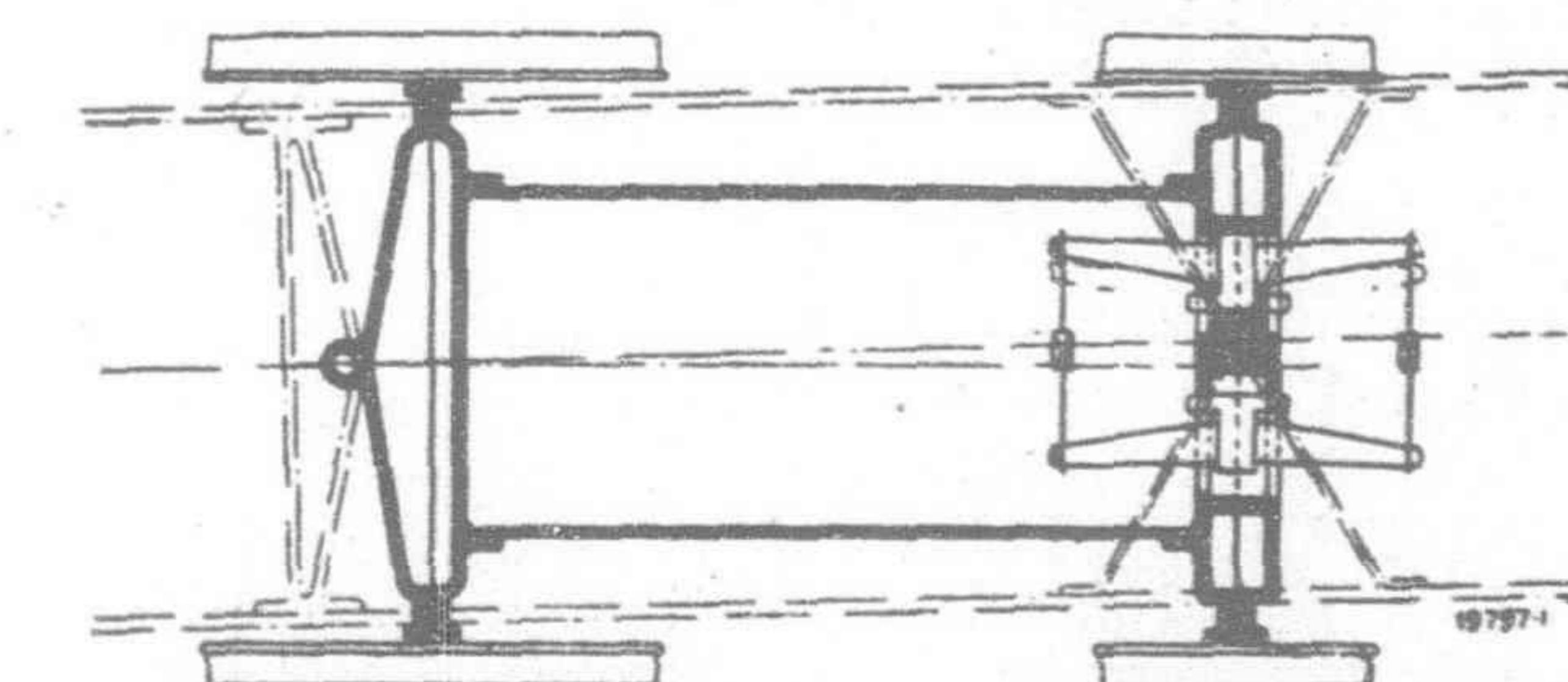


Fig. 7.—Diagrammatic View of Bogie with Spring Centring, Driving Axle with Brown Boveri Individual Axle Drive, and Pony Axle

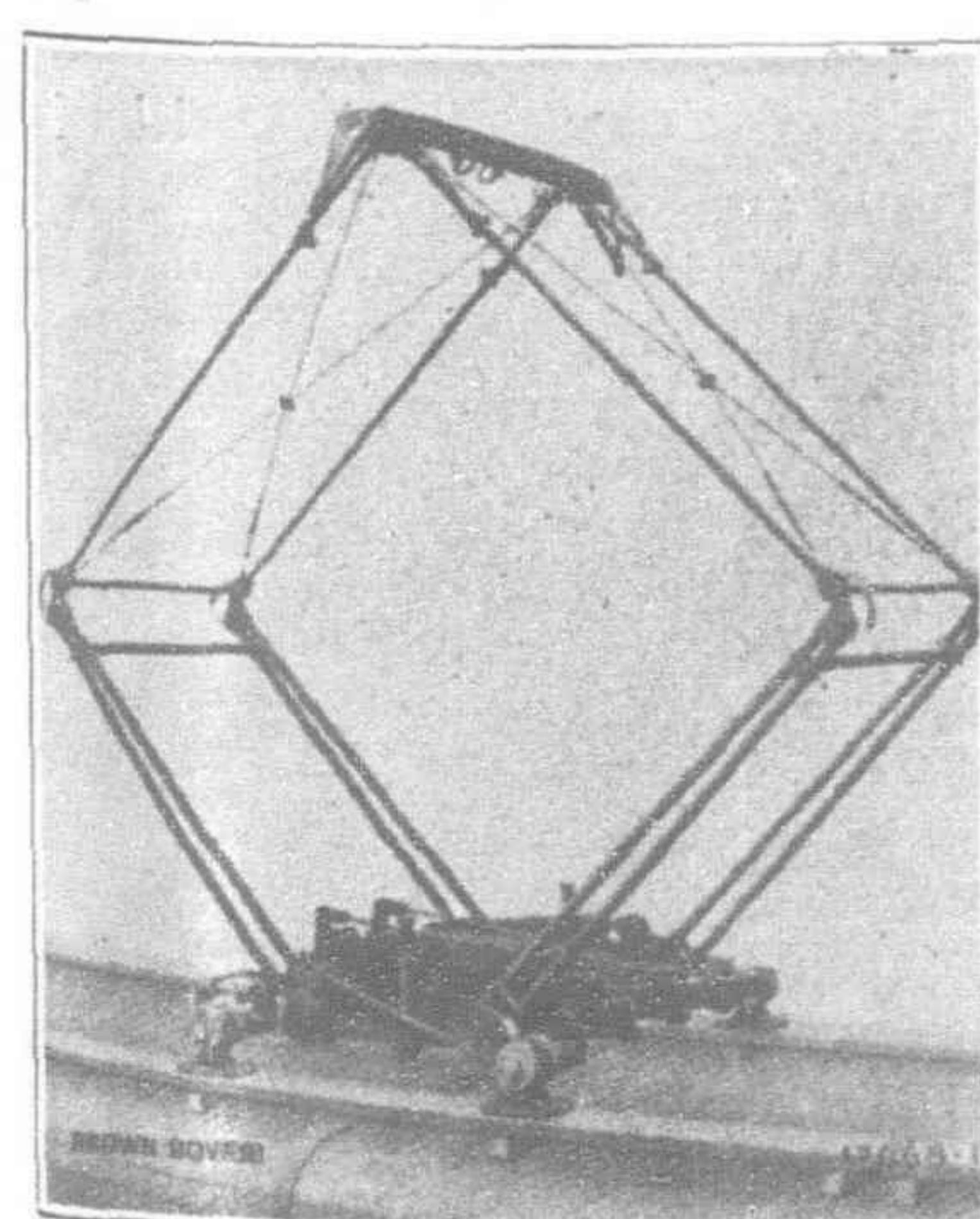


Fig. 8.—Pantograph Current Collector

side walls of the body are provided with openings which are covered with gauze to prevent insects entering. The openings enable air to enter for cooling the body and traction motors. The cooling air, after passing through the motors, flows over the starting and braking resistances and is expelled underneath the locomotive.

The locomotives are fitted with automatic vacuum brakes which operate on all driving and pony axles; a hand brake in each driver's cab operates on the two driving axles and pony axle at the respective ends.

The braking pressure exerted by the vacuum brake amounts to 87 per cent. of the adhesion weight and 30 per cent. of the pony axle weight. The corresponding figures for each hand brake are 80 per cent. of one half of the adhesion weight and 25 per cent. of the pony axle weight. Each cab is fitted with a Teloc recording speedometer. The remainder of the mechanical equipment *i.e.*, cow catcher, draw and buffering gear, signal devices, etc. is in accordance with the company's specifications. The sanding gear and the interlock for the high-tension chamber are worthy of mention.

The high-tension chamber is usually closed by means of two doors. The compressed air pipe to the current collector includes a cock, the key of which normally points to "open." In order to remove the key, the cock must be closed. The compressed air pipe is opened when the cock is closed, thus lowering the current collector. The doors of the high tension-chamber can then be opened by means of this key. As long as the doors are open it is not possible to remove the key from the lock or to raise the current collector. Two isolating switches are mounted on the removable portion of the roof; these form an additional protection, and are in the conductors between the current collectors and the main switch. The operating spindles extend through the roof of the locomotive. A defective current collector may be cut out by its isolating switch. Both isolating switches must be opened before the high-tension room may be entered for carrying out an inspection or a repair. All leads from the collectors are thus interrupted and therefore not under tension; the only exception is the lead from the battery which is not at a dangerous potential. The

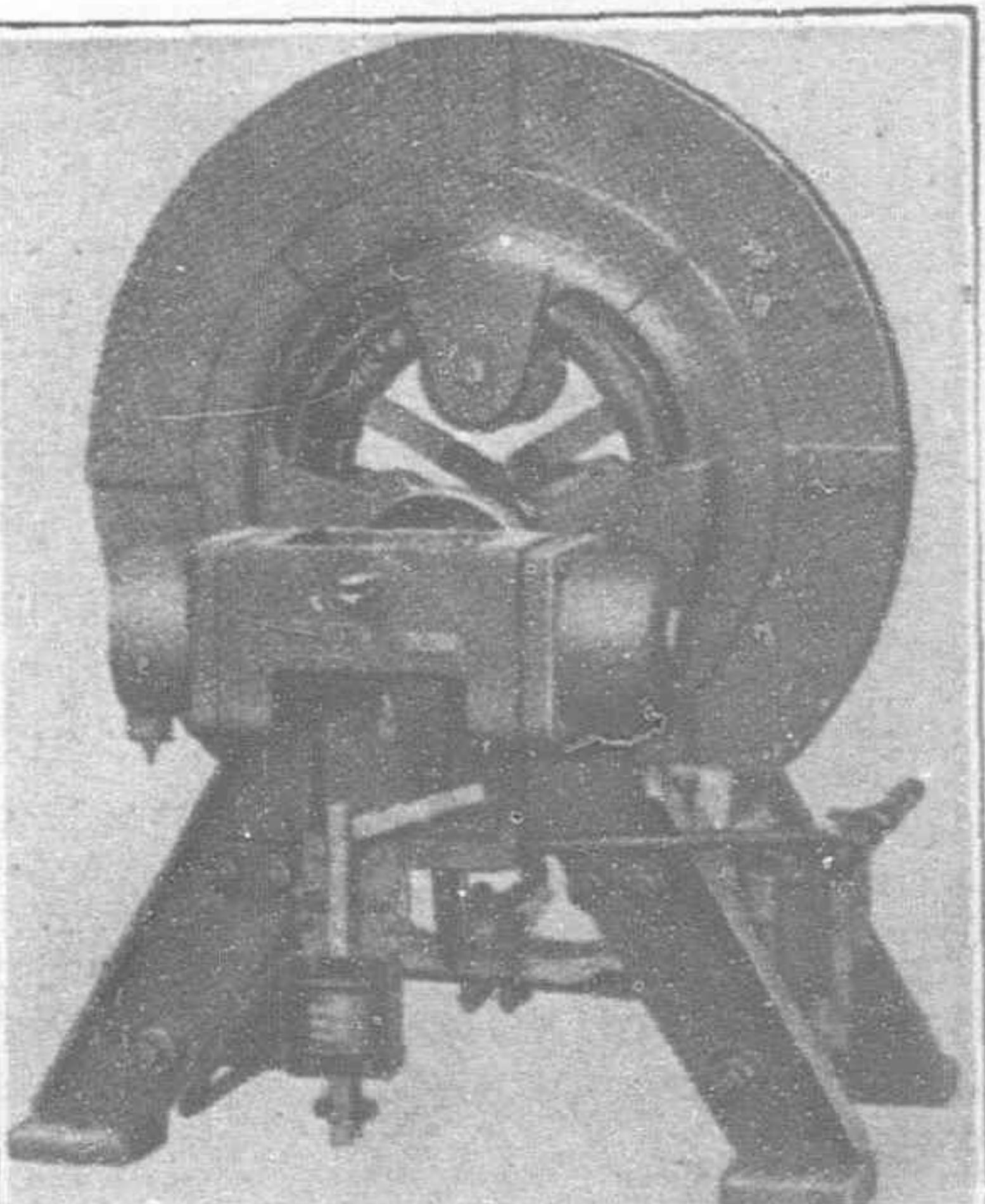


Fig. 9.—Main Switch of the Locomotive

Chinese Government and Provincial Railways Demand Open Hearth Steel

AFURTHER testimonial to the high regard in which Open Hearth Steel is held by the more advanced railway engineers in this country lies in the contracts that have recently been placed with American manufacturers for Open Hearth Steel rails and accessories.

These embrace the following railways and tonnages :—

The Hulan-Heilung Railway, approximately 9,000 tons, through Messrs. Suzuki & Company with the United States Steel Products Company.

Kirin-Tunhwa Railway, approximately 19,500 tons, through Messrs. Mitsubishi & Company, Ltd., with the United States Steel Products Co.

Kin Puku Railway, approximately 10,000 tons, through Messrs. Okura Trading Company, with the United States Steel Products Company.

Peking-Mukden Railway, approximately 18,000 tons, through Messrs. Andersen, Meyer & Company, Ltd., with the United States Steel Products Company.

With a new era of railway construction now dawning throughout China, it is significant to note that the superior quality of Open Hearth Steel is fast supplanting steel formerly produced by the Basic Bessemer Process, in all departments where the elements of durability, safety and uniform dependability are required.

The following is a translation of a paper issued by the Rombach Works of Westphalia, Germany, entitled "Siemens-Martin Steel as Material for Tee Rails and Grooved Rails," and is exceptionally interesting, particularly so as it originates from a country which is prolific in raw elements suitable for the production of Bessemer Steel.

The tendency to employ a higher quality for materials to be used can be observed since the last few years in the whole field of engineering. The reason for this development is due on the one hand to the fact that loads and working stresses applied to materials of construction have increased, and on the other hand a more economical operation is looked for.

For quite a while it has been decided to increase the strength of steel castings and steel forgings for the different purposes ; and lately the practice has also been started of using materials in building construction of higher physical strength, and this tendency more recently is especially noticeable in the whole field of transportation.

Accordingly, it seems entirely reasonable that Government (steam) railways as well as street railways, because of the use of heavier rolling stock and, later, the increase in traffic density, should also in the case of rails look for a material of correspondingly higher quality which will in all respects meet these severer conditions.

Under these conditions, and also in the interests of safety, it is very important which quality of steel is to be used for the rails, and particularly for grooved rails, which will meet these conditions and insure the longest possible life.

A statement which the United States Steel Products Company has circulated deals with new recommendations concerning special specifications for steel rails. This publication shows that in America during the year 1907, 3,380,025 tons of rails were furnished in Bessemer steel, and 252,704 tons in open-hearth steel ; whereas in the year 1922 only 23,317 tons of Bessemer steel rails as against 2,033,000 tons open-hearth rails were placed in track.

This furnished sufficient evidence that in America the best results have been obtained with the open-hearth steel as material for rails.

We produce in our works open-hearth material exclusively, and have always claimed that open-hearth steel is the best steel for rails. This fact is best demonstrated, in the first place, by statistics on Tee Rails furnished by us in the years 1891 to 1912 for the Prussian State Railways. In this period of 21 years, and with a total quantity of 135,736 tons of rails furnished, only 73 tons had to be replaced, which represents a percentage 0.05378. In the same period no other German rail mill could show such a low percentage of replacement. We believe that this favourable result is principally due to

the fact that we manufactured the State Railway rails from open-hearth steel exclusively.

Not only for State Railway rails has the open-hearth proved superior, but also for grooved rails in street railway tracks. This is evident because lately the most important street railway companies, in our as well as foreign countries, have expressed a preference for open-hearth steel rails.

Also representatives of switch manufacturers who are buying rails for their fabrication, have continually stated that the great difference between rails of open-hearth steel and Bessemer steel in their operations, such as planing, cutting, drilling, etc., is quite obvious, and demonstrates itself through the fact that rails made from open-hearth steel shows a more homogeneous and cleaner structure as compared with basic Bessemer rails, the latter also showing frequent breaks, blow-holes, segregation, etc.

In spite of the attempt made lately to claim that Basic Bessemer steel is equal in quality to open-hearth for rail material, the opinion of the railway Administration is practically almost unanimous that with the long years of experience in their operations, the incontrovertible conviction has been reached that open-hearth steel, both for the Tee Rails and also for grooved rails, has undoubtedly gained the preference over basic Bessemer steel.

In studying the process of manufacture of open-hearth steel and basic steel, it is easy to draw the conclusion why open-hearth steel is superior to basic Bessemer steel. In order to elucidate this, a few explanations are given below.

Physically, rail steel represents a mixture of chemical compounds, namely, the iron carbon alloy, carbide of iron, or cementite, manganese carbon alloy, manganese carbide, manganese phosphides, manganese sulphide, and a solution of silicon and various gases in iron. Most of the above mentioned constituents are present in the form of minute crystals in the rail steel, and are held together by cohesion. The strength of the rail steel is equivalent to the combined effective strength of all the individual crystals. With similar chemical composition and heat treatment of the steel, this physical strength increases with the decrease of the phosphorus and sulphur contents, as well as other injurious impurities contained in the steel.

By far the hardest of the above mentioned constituents, which decides the resistance to wear of the rail, is the carbide of iron, or cementite. This compound is one of the hardest materials in existence. The more cementite present in the rail steel, the greater will be its durability and resistance to abrasion. An increase of cementite in the rail steel, however, is only possible, without injuring the toughness of the steel, under the following conditions :

1. So-called impurities, such as phosphorus and sulphur compounds, as well as slag inclusions, must be reduced to a minimum.
2. Great care must be taken to produce steel which has the least amount of gas in solution.

In order to meet the first condition, to keep the impurities in the steel (phosphorus and sulphur compounds and slag inclusions) at a minimum, it is necessary to permit the chemical reactions to take place by effecting the greatest possible surface contact between the bath of steel and the refining slag, and by maintaining a gentle boil as long as possible.

In comparing the open-hearth process and the basic Bessemer process in regard to these conditions necessary for the refining of the product, we have the following :

1. The reaction surface between bath and slag in the open-hearth process is many times that which is effective in the basic Bessemer process.
2. The open-hearth steel bath is exposed to the purifying action of the slag during refining 6 to 7 hours. During this time all chemical reactions are taking place, especially dephosphorization and the desulphurization of the bath to such an extent that when the steel is tapped, an almost perfect chemical equilibrium can be obtained between the refined bath and the highly basic slag. With the basic Bessemer process this reaction takes place in about twenty minutes,

or in one eighteenth of the time during which open-hearth steel is refined and finished. The rephosphorization, which can hardly be avoided in the basic Bessemer process before pouring, is proof that at the finish of the heat the chemical equilibrium between slag and bath, which is the principal condition for the production of quality steel, has not been obtained.

3. During the working of the heat the steel bath in the open-hearth furnace is kept quietly boiling by ore and other additions. Towards the end of the process and with the completion of the chemical reactions, this boiling diminishes, and all, even small particles of slag and other impurities which were suspended in the steel bath pass into the slag. In the basic Bessemer process, slag and steel are brought into intimate contact with each other on account of the very violent reaction which takes place between the oxygen contained in the blast and the steel bath. The particles of slag which are thereby carried into the steel have no time later on to rise to the surface, and will be present to a large degree in the finished material which, in this case, is the rail of basic Bessemer steel. They naturally produce in the rail a dangerous condition, and are liable to have disagreeable consequences in service; and they always affect the physical properties of the basic Bessemer steel. In comparing the open-hearth process with the basic Bessemer process there are, therefore, five points to be presented, which insure a decidedly superior quality for the open-hearth steel.

1. Even with the use of very poor scrap the impurities in an open-hearth charge in the pig and scrap process amount to only a fraction of the impurities which have to be removed from the bath in the basic Bessemer process.

2. In the open-hearth process the surface contact for chemical reaction between slag and bath is much greater than with the basic Bessemer process, and correspondingly there is also a better refinement of the steel.

3. The time for chemical reactions during the melting of a charge in the open-hearth furnace is much longer than in the basic Bessemer process, and correspondingly the resultant product is cleaner.

4. The absorption of small particles of slag in the bath is avoided by the open-hearth process, and there even takes place an elimination of the non-metallic inclusions from the steel bath into the slag during the working of the charge. The nature of the basic

Bessemer process has inherent danger of forcing minute particles of slag into the bath, where they remain and are the cause for an impure and unsafe material for service.

5. The deoxidation of the steel bath can only be effective when such deoxidizing conditions are continued for a longer period, and this can be maintained in the open-hearth process for hours. During this time the effect of deoxidation can be controlled by concurrently taking tests from the furnace which are submitted to an exhaustive physical examination and in that way a uniform steel can always be produced.

In the basic Bessemer process the deoxidation is carried out as well as possible in a few minutes. It is, therefore, principally because control of its effect by examining tests does not take place, more or less complete, resulting in a heterogeneous material, as is well-known by the user of basic Bessemer steel.

By a study of the given comparison it will be evident, even to those who are not metallurgists, why a continuous metallurgical, physical and chemical control of the steel made in an open-hearth furnace offers a more certain assurance of superior quality, as compared with basic Bessemer steel, in regard to purity, uniformity and desired chemical composition.

In practice this is also well-known. Materials for motive power construction which are subject to even more severe service than a rail (for instance, tires, wheels, axles, springs and driving parts), are to-day produced exclusively from open-hearth steel because basic Bessemer steel, on account of its inferior, heterogeneous composition cannot meet the conditions which are required for such parts to insure safety and resistance to wear.

Comparative investigation of the physical properties of basic Bessemer rails and open-hearth rails based on the principle of mass statistics, show the following in general:

1. With equal physical strength, the open-hearth rail has greater toughness and greater resistance to wear than the basic Bessemer rail.

2. With equal ductility, the open-hearth has far greater resistance to wear, higher impact resistance and greater hardness than the basic Bessemer rail.

3. With equal hardness, the open-hearth rail has greater toughness and greater resistance to wear than the basic Bessemer rail.

New Steel Cars of The Hanshin Electric Railway Co., Ltd.

At present 20 steel cars of the Hanshin Electric Railway Company are in operation between Osaka and Kobe, and an additional number of the cars of similar type which the Company placed orders last year with the four works, namely, the Osaka Iron Works, Fuji-Nagata Shipbuilding Yard, Tanaka Car Manufacturing Company and the Kawasaki Dockyard for its manufacture has recently been completed.

Construction of the Car and its Equipment.

The Body of the Car.

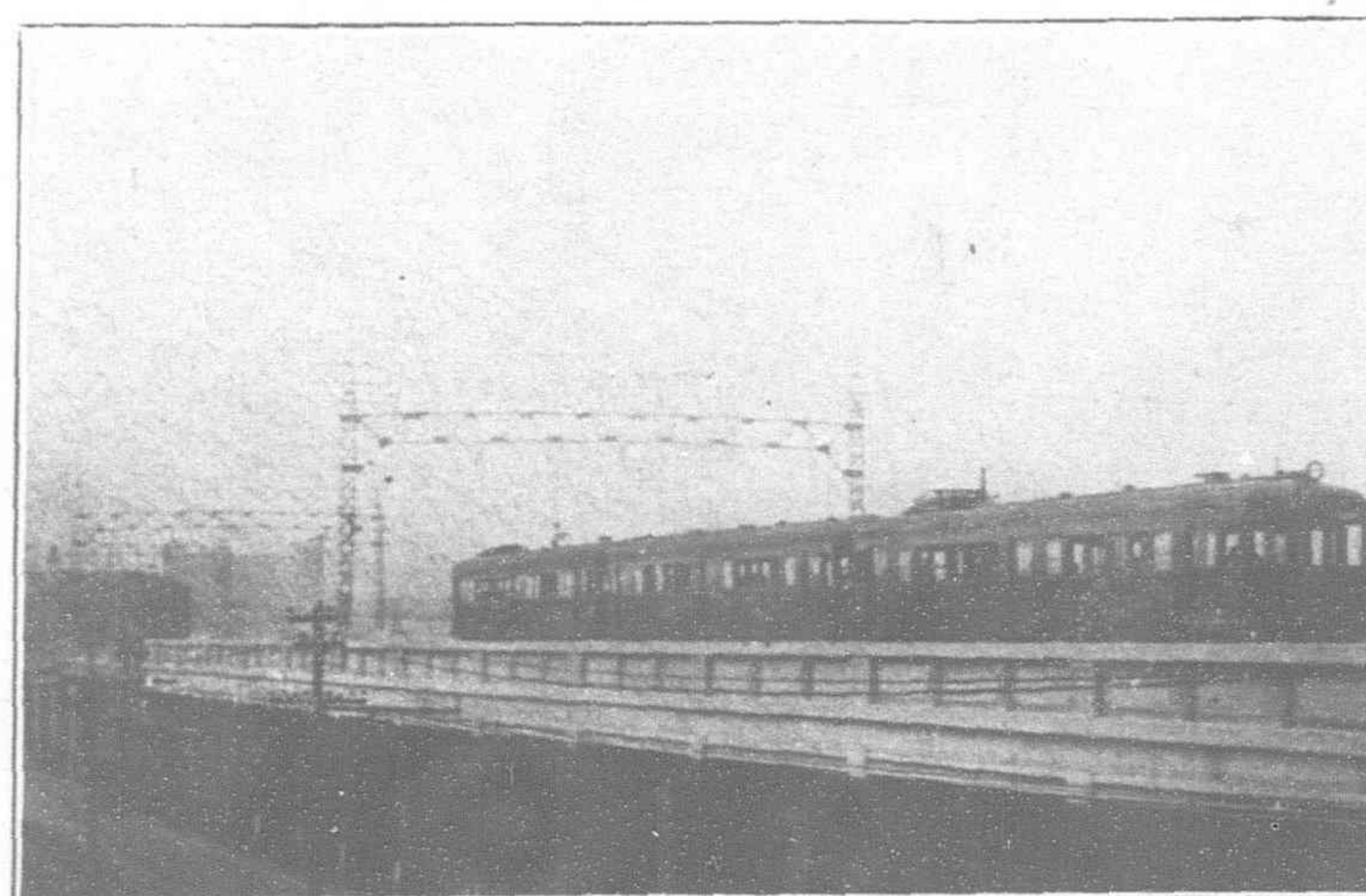
The whole length, 45-ft.-10-in. Width, 7-ft.-7-in.

Length of compartment 39-ft.-10-in. Width of compartment, 6-ft.-10½-in.

Height of compartment, 7-ft.-10-in. Weight, 20.98 Eng. Ton. The height from the surface of rail to the floor of compartment 3-ft.-10-in.

Seating accommodation for 90 persons.

The cars are each installed with four TDK 513 Type, 65 H.P. tapped field motors supplied by the Toyo Denki Seizo Kabushiki Kaisha.



The Hankyu Elevated Railway, between Osaka and Juso, Using All Steel Cars

principal parts of the adjuster is as follows :

- | | |
|-------------------|------------------------|
| 1.—brake cylinder | 2.—adjuster cylinder |
| 3.—adjuster pipe | 4.—adjuster cross-head |
| 5.—adjuster screw | 6.—ratchet nut |

The body of the car is of same type with that of Baldwin 75-25-A. The result of a trial run proved to be excellent. The highest speed of the car is 50 miles per hour, and it will not take more than 46 minutes to run the section between Osaka and Kobe.

The bearing is SKF roller bearing. Controller is from Shibaura Engineering Works, Co. This is RPC Type motor controller which is of same type with the G.E.'s MK Type motor controller.

As the braking arrangement, the following are equipped with : WH 7 H.P. Compressed air motor, 12-in. by 12-in. brake cylinder, AMM triple valve and M-24 brake valve. For the above, the reservoir pipe system is adopted.

American automatic slack adjusters are used for the whole of the Company's cars, as they were found very effective for the high speed service now operated by them. As shown in Fig. 2, the

principal parts of the adjuster is as follows :

- | | |
|-------------------|------------------------|
| 1.—brake cylinder | 2.—adjuster cylinder |
| 3.—adjuster pipe | 4.—adjuster cross-head |
| 5.—adjuster screw | 6.—ratchet nut |

A Visit to the Diesel Engine Shops at the Sulzer Works, Winterthur

CHE undersigned had lately occasion to visit the works of Sulzer Brothers at Winterthur. Such a visit certainly offers an excellent opportunity of seeing how the most modern form of prime mover, the Diesel engine, is constructed in one of the best equipped works. On entering one of the buildings devoted to Diesel engine construction, the impression at once given by its size is that the construction of engines is being carried on here on a very large scale. The dimensions of the bays, the size of the machine tools, the capacity of the overhead cranes and other equipment, are sufficient to allow of the construction of engines still larger than those which have up to the present been built.

In the Winterthur works alone, the area covered by the buildings devoted to the construction, erection and testing of Diesel engines is about 215,000 sup. ft. In this figure, the pattern shops, foundries, smithies and the packing and forwarding departments are not included, although these are all employed to a considerable extent for Diesel engine work. Fig. 1 is a plan of the Sulzer Works at Winterthur. The shaded portions show the workshops in which the machining, erection and testing of Diesel engines is carried out. These workshops are mainly located in the two large buildings marked A and B. Between them is a court where castings from the foundry are stored. The court is served by an overhead crane, and castings are transferred by its help into trucks and then transported by rail into the several workshops. The building marked A is entirely constructed in ironwork, and consists of three bays, each about 240-ft. long and 62-ft. broad, running the whole length of the building; the height to the highest part of the roof is 52-ft. 6-in. Between these bays are two stories of galleries. On the north front of the building there is a four-storey structure. All the works are served by 66 cranes and lifts. 5 of the large cranes have a lifting capacity of 30 tons. There are about 35 small cranes below and on the galleries. All the cranes are operated electrically. The goods are raised to the various floors by means of 7 hydraulic lifts. The offices and work places for the managers of departments, testing engineers, foremen and in-

spectors, piece-work offices, etc., are quite close to their departments. The places where drawings, tools, gauges, etc., are given out are situated as near as possible to the shops they are intended to serve. Fig. 2 shows a view looking down into one of the bays in the building A. In this the large machine tools are located.

Within the limits of an article in a technical paper, it is of course impossible to describe every machine tool and all apparatus in the shops, and therefore only a few special machines and apparatus will be mentioned here. If we follow the path taken through the shops by the larger parts of the engines, we arrive first of all at the marking-out floor. There the parts are marked with lines, etc., denoting the places requiring machining. In this respect it is worth mentioning specially one of the largest marking-out floors, of a size that will certainly seldom be found elsewhere. This measures 44 by 29.5-ft. and serves not only for marking-out large pieces of work but also for machining them. The pieces are then securely fixed to the marking-out floor, and, in order to carry out the necessary operations on them which cannot well be done on ordinary machines, or when it would not pay to move the work to the machines for some operation or other, such work is carried out by special machines which can be fixed to any convenient part of the marking-out floor, and with these milling, boring, etc., can be done without having to move the work any distance.

The advantage of this method of working is that the machine tools can be adjusted to work in any desired direction. At one end of the marking-out floor there are two milling and drilling machines which can operate on the pieces on the floor. Fig. 3 shows a view of the marking-out floor from above, and from this view can be seen the manifold uses to which it is put.

Bedplates, columns and pump parts, which require mainly milling and planing operations, are handled by the large millers and planers. Generally a number of such pieces are introduced to the machines beside each other, and worked simultaneously. The large milling machine shown in Fig. 4, can work with four different milling cutters, two for machining the upper surface and one each for the sides. Each milling cutter is

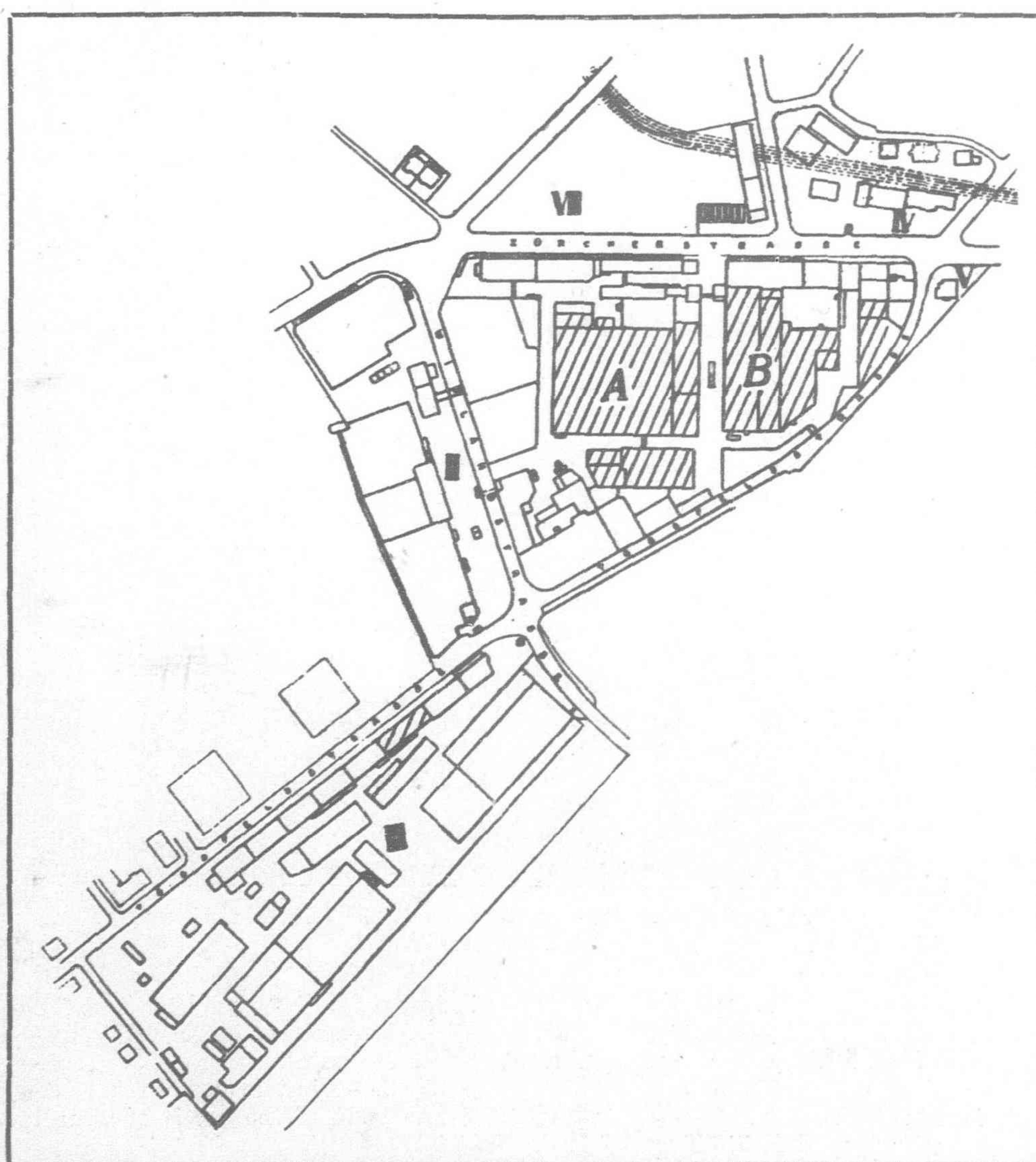


Fig. 1.—Plan of the Sulzer Works at Winterthur

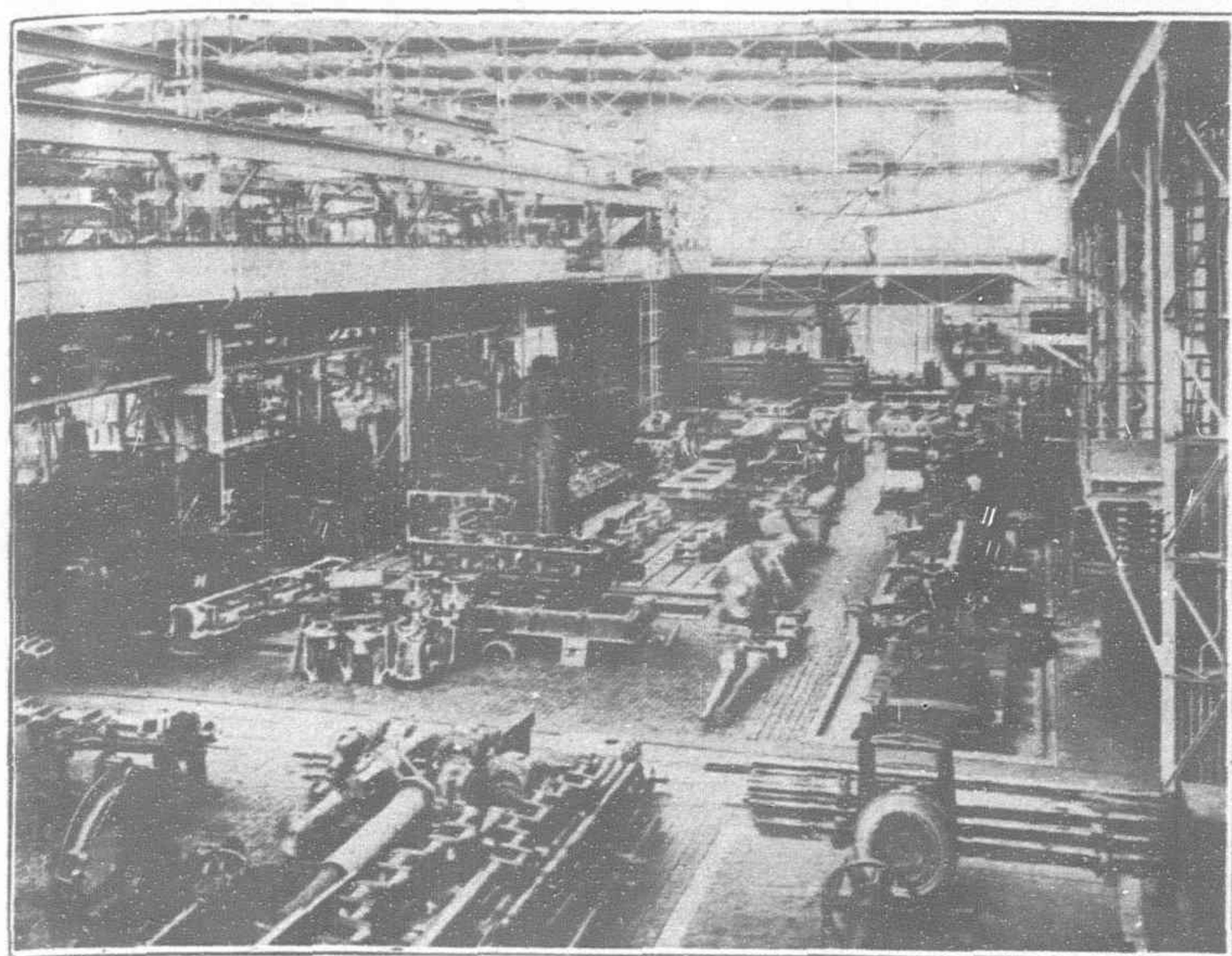


Fig. 2.—The Large Machine Tool Shop

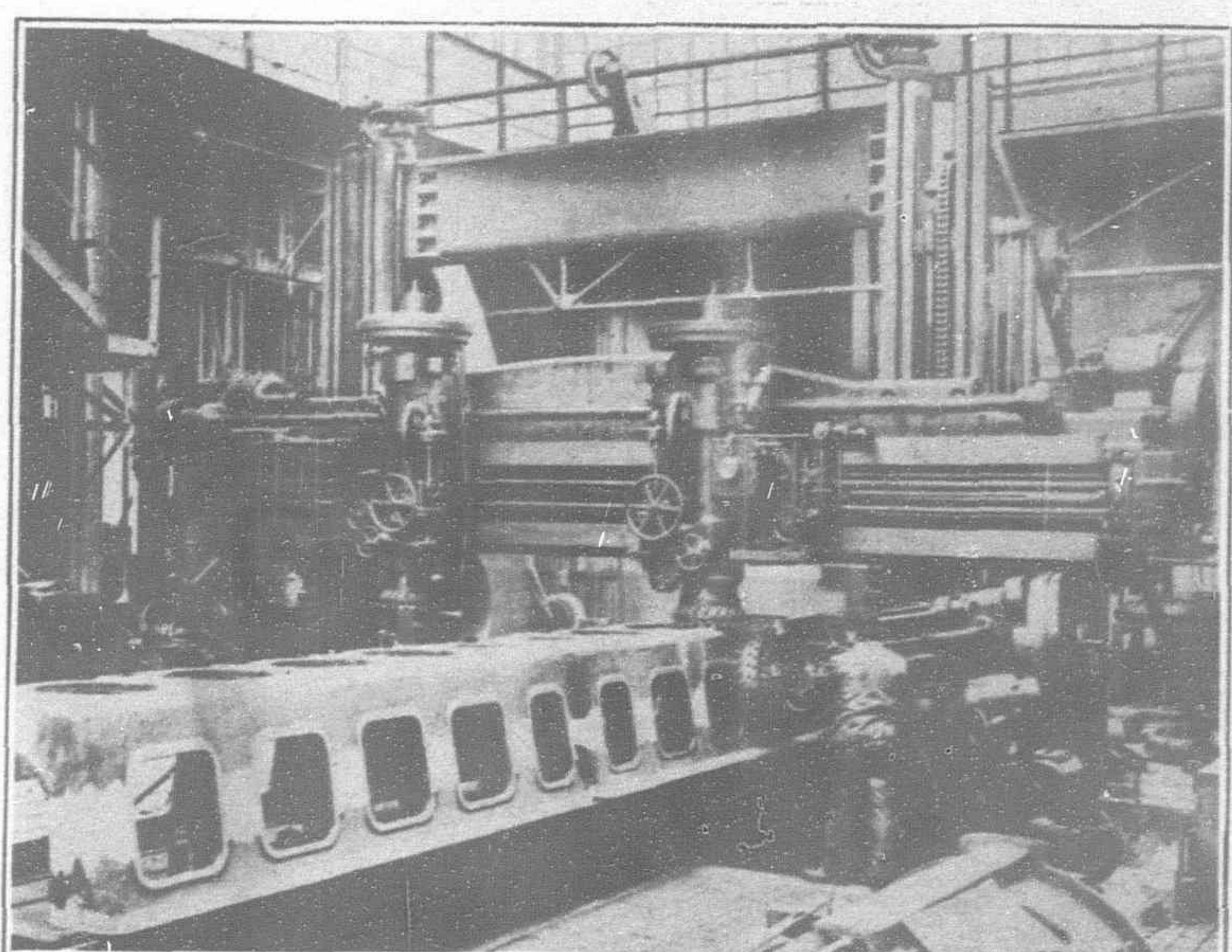


Fig. 4.—Large Milling Machine

driven independently of the others by a separate electric motor. Instead of the two upper vertical cutter heads, cylindrical cutters can be used and by means of these the surface into which the bearings are fitted can be machined. This milling machine is fitted with a reciprocating platform on which the work is fixed, but in the other milling machines, for example in that shown in Fig. 5 the work remains stationary and the support carrying the milling cutters travels over a long rail. Fig. 5 also gives a good idea of the kind of parts here machined and of their dimensions, crankshafts are turned and ground on the parts concentric with the shaft on lathes which have a maximum of 42.7-ft. between centers. For machining the crankpins the so-called Moll apparatus Fig. 6 is used. On this the shafts are held fixed, whilst the heads carrying the tools turn in a circular frame. This frame can be moved parallel or at right-angles to the shaft, thus allowing the crankpin to be machined at any desired eccentricity.

The milling and drilling machines on which medium-sized pieces are worked, are also of interest. These are located below the galleries. Here cylin-

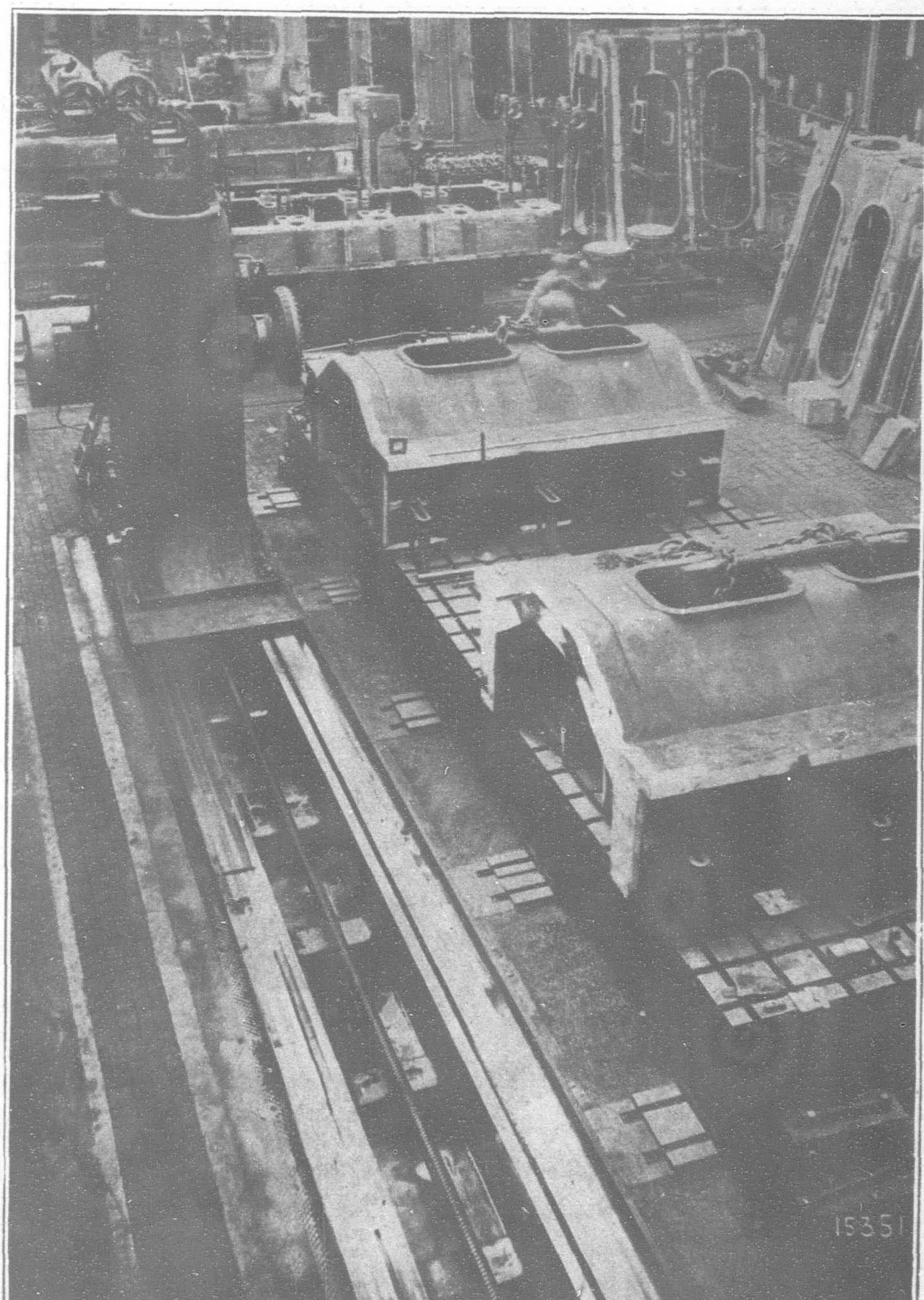


Fig. 5.—The Long Rail for Carrying Milling Machines

der, cylinder covers, and other similar parts are machined. Among these machine toolsthere are some particularly ingenious examples, as, for example, the piston grinding machine, fig. 7, on which pistons up to 40-in. in diameter can be ground. The pistons are fixed between the centres. The grinding wheel is fitted in a support movable along and at right-angles to the machine. The grinding wheel is driven by an electric motor, and the movement of its support is also effected electrically.

The building marked B on the plan in Fig. 1, was devoted until quite recently to the manufacture of centrifugal pumps. The construction of continually larger Diesel engines, however, made it necessary to equip this building also for Diesel engine work. Even before the manufacture of pumps was removed to the Sulzer Works at Oberwinterthur, the cylinder-boring machines and the lathes for machining cylinder-liners and flywheels were located here. The whole building is now devoted mainly to the manufacture of Diesel engine parts. Here also there are large drilling and milling machines. Fig. 8 shows two vertical drilling machines. The work to be drilled is

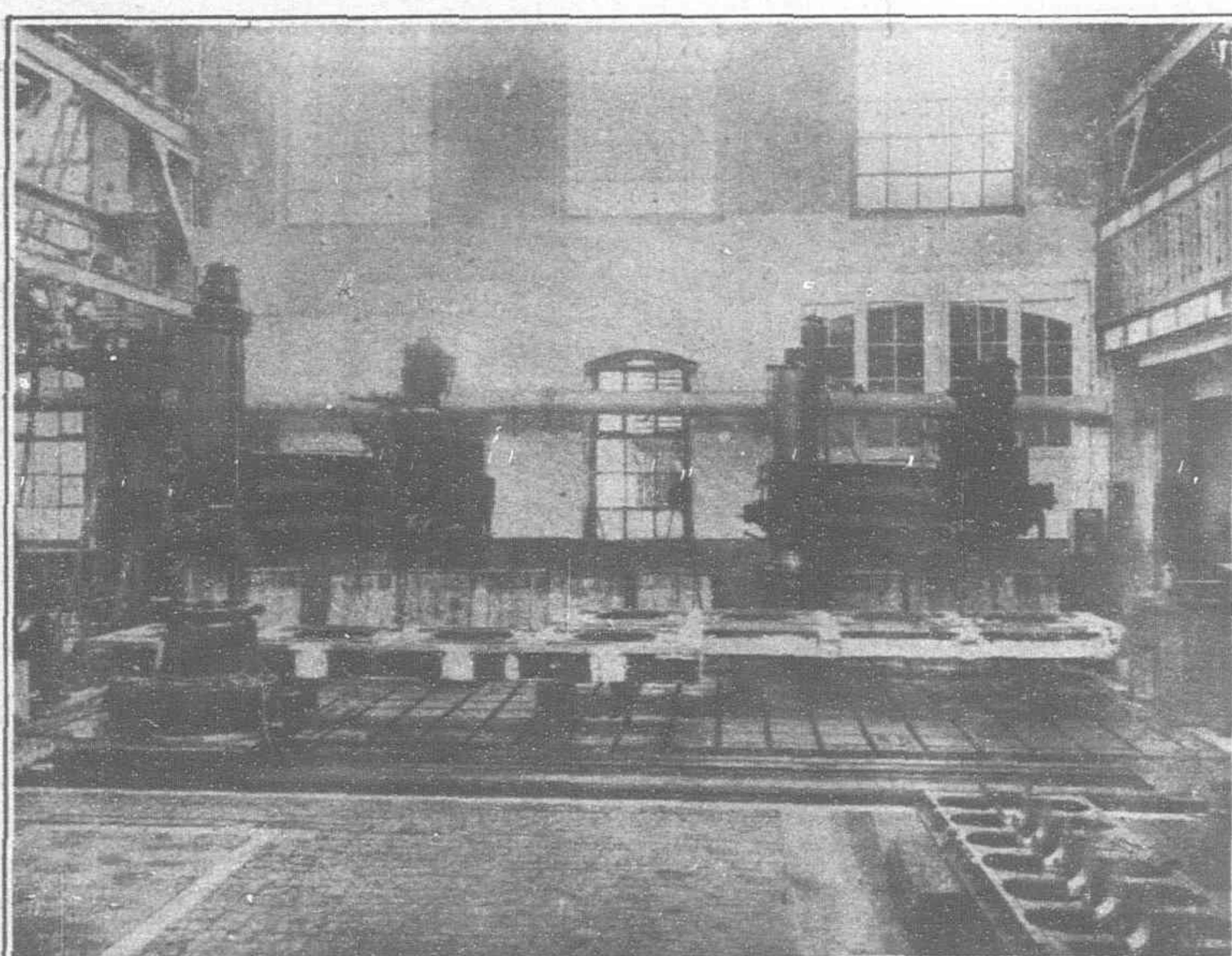


Fig. 8.—Verticle Drilling Machines

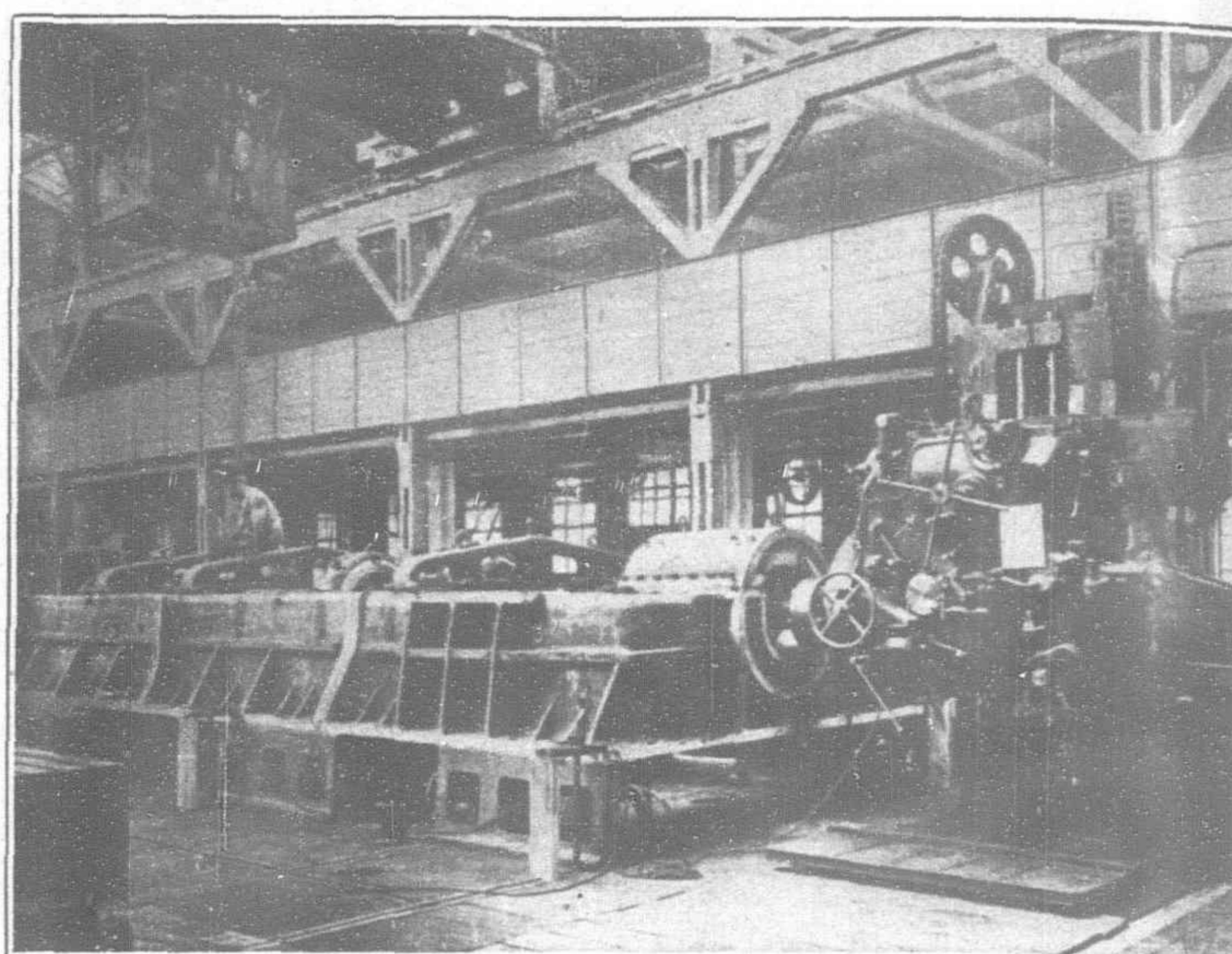


Fig. 9.—A Machine for Boring Main Bearings and Milling their Ends

fixed on a plate between the two drilling machines. Fig. 9 shows a machine for boring main bearings and milling their ends. The piece of work shown in the illustration is part of the bedplate of a 5,200 b.h.p. two-cycle Diesel marine engine. Another type of medium-sized machine tool is shown in fig. 10, a vertical boring and turning mill with two uprights. It can be seen from the illustration how the crank arms of a built-up crankshaft are bored out on it. On the galleries there are lighter machine tools and lathes. In one corner are special machines for machining piston rings; on another series of machines the valves are machined; on another the cam-shafts, cams, etc., etc.

From here the pieces pass to the fitting shops. The fitting shops for medium sized and lighter pieces are also on the galleries. The parts of the engines are transported from floor to floor in trucks by means of hydraulic lifts. Heavy pieces can also be brought by the cranes to the desired place and then removed in a similar manner. The work of fitting is distributed over several groups of men, each of which is occupied with finishing certain parts. One group is occupied exclusively on fitting and assembling fuel

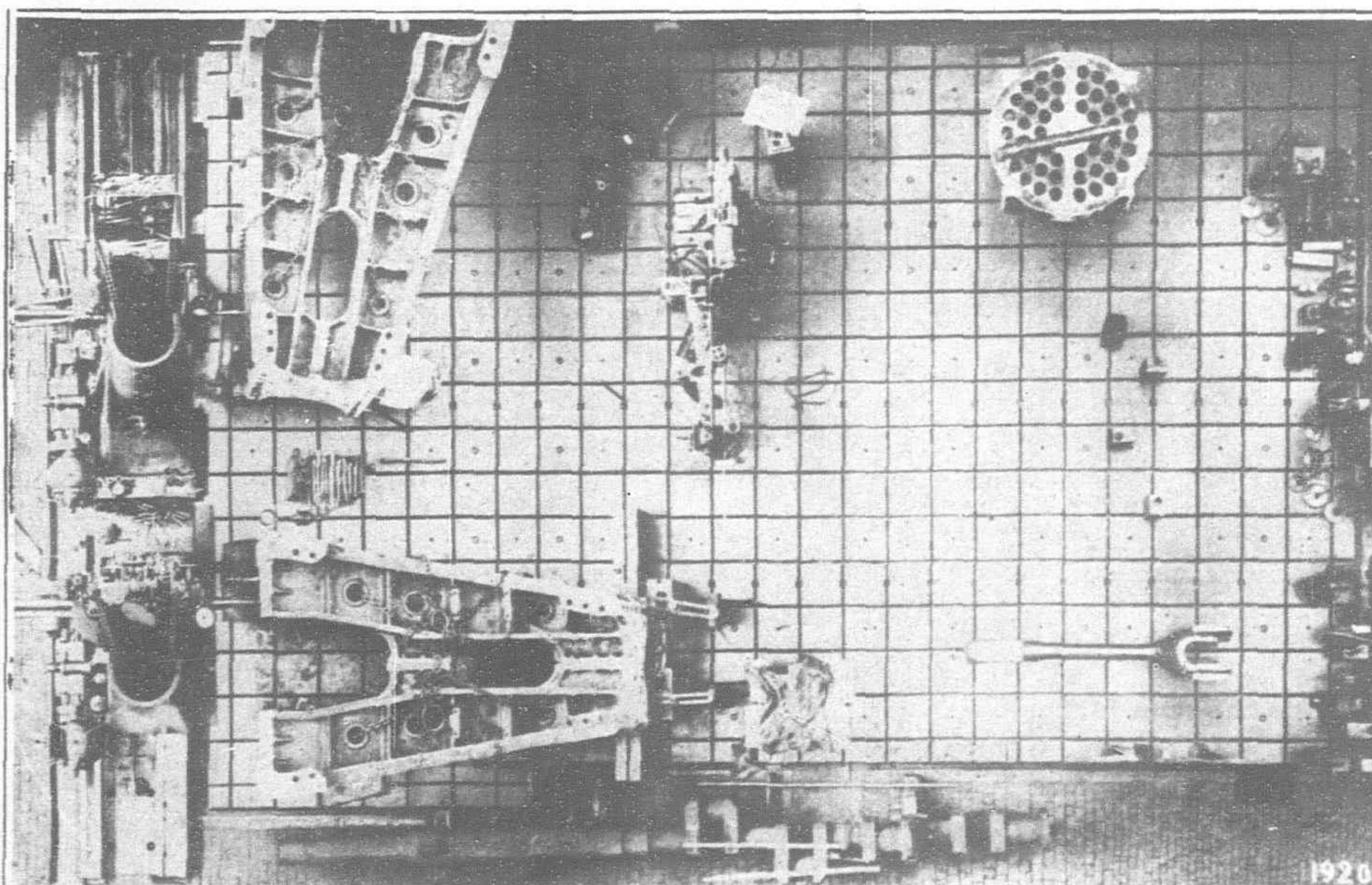


Fig. 3.—The Marking Out Floor

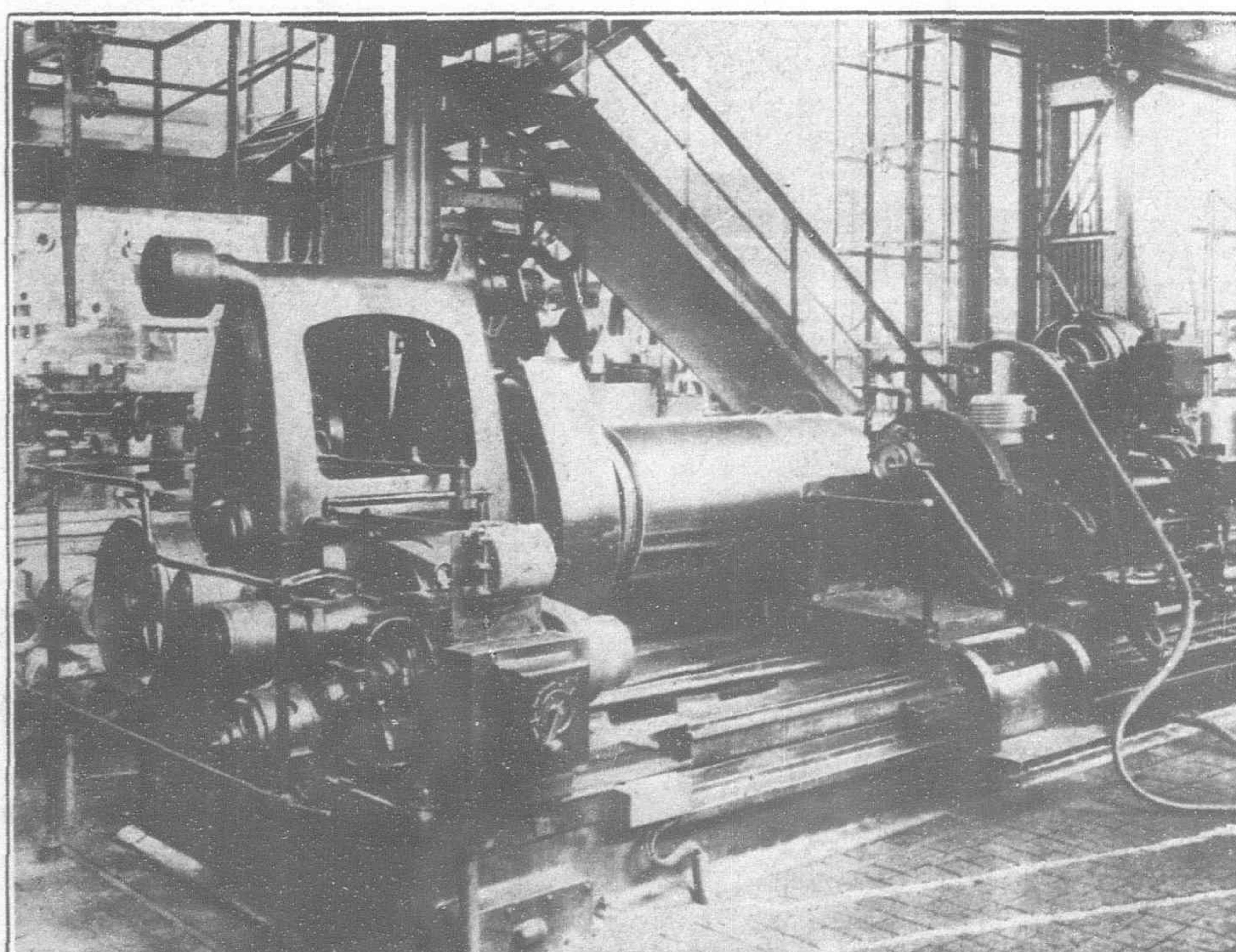


Fig. 7.—The Piston Grinding Machine

pumps, other with valve gear, air pumps, running gear, etc., so that a high quality of workmanship can be guaranteed owing to the great experience gained by the men through working always on the same parts of the engines.

When individual parts are finished, the smaller and medium-sized pieces are taken to the Finished Parts Store to wait there until all parts required for assuring continuous erection are ready and the actual building of the engine can be commenced. In the case of large engines, this work is carried out in the middle of the large bays, whilst smaller engines are erected under the galleries. In the erecting shops all parts are machined and fitted together in such a manner that they can function properly; all shaftes and crosshead slides, valve gear and governors are correctly adjusted, and their parts keyed in the proper positions relative to each other. Also all external parts such as platforms, water and air piping, are fitted to the engine. Fig. 11 shows a 3,600—b.h.p. marine engine in the first stages of erection. The bedplate has already been bolted together and now the crankshaft is going to be fitted to the main bearings. During erection a considerable amount of



Fig. 10.—A Vertical Boring and Turning Mill with Two Uprights

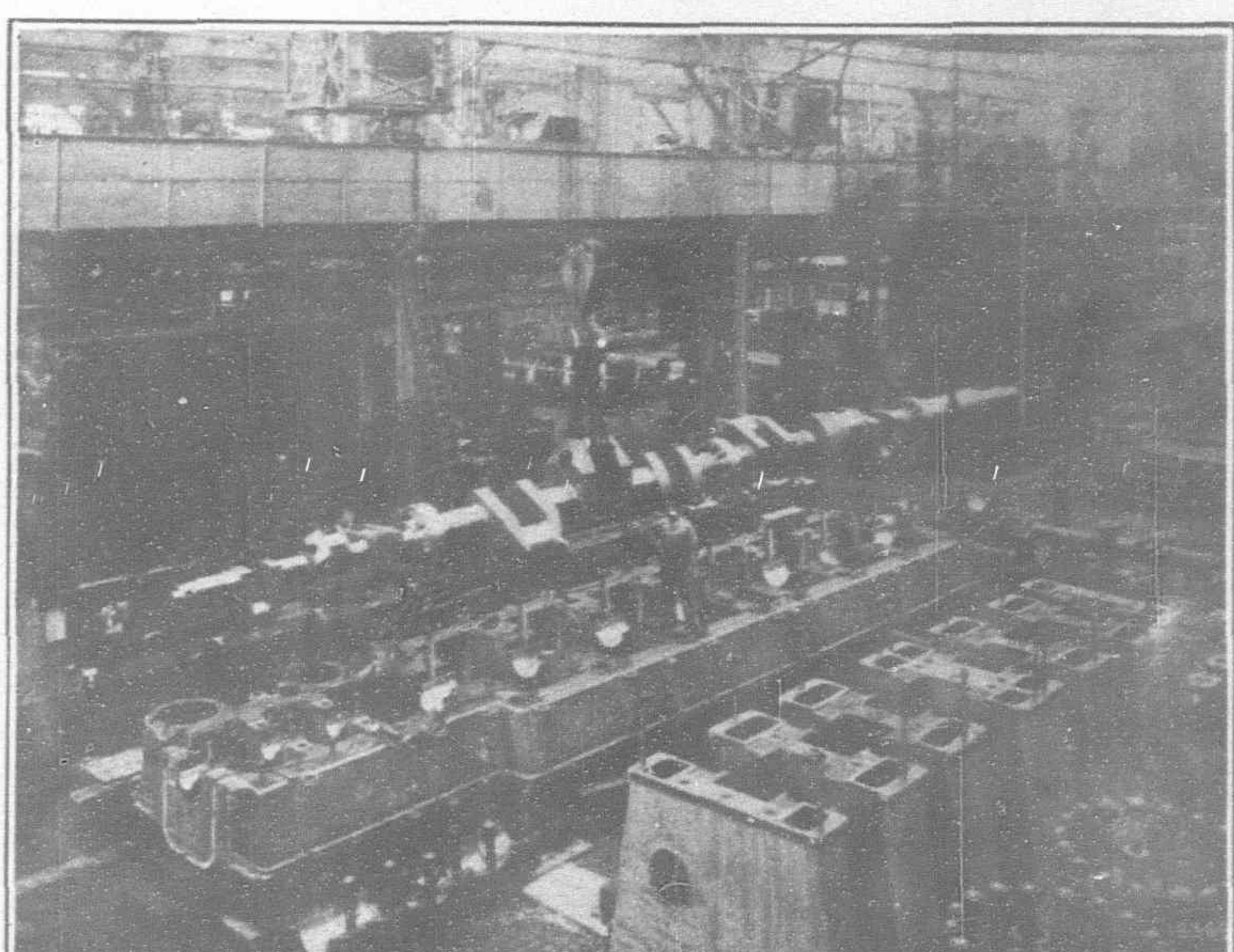


Fig. 11.—A 3,600 B.H.P. Marine Engine in 1st Stage of Erection

adjustment must be made, but thoroughness in this respect is amply repaid later when the engine in finally tested and put into service. In order to ensure the correct location of all parts, the bedplate is accurately levelled, and all other parts are arranged in their proper positions, so as to ensure faultless working when the engine is put to work. Fig. 12 shows a 3,600—b.h.p. engine with erection half finished. The columns for the 6 working cylinders are in place on the bedplate, and they are being levelled up so as to have the tops at one height for taking the entablatures, each of which will carry 3 cylinders. The same work is carried out on the shorter columns to the left, which support the cylinders of the scavenging and injection air pumps. Fig. 13 gives a view in the bay which is used particularly for erecting medium-sized marine Diesel engines. Fig. 14 gives a better impression of the interesting activity in these shops. In the foreground can be seen three engines on the test bed; to the right, there is an eight-cylinder two-cycle marine engine of 4,000 b.h.p. This engine was built for the Stoomvaart Maatschappij Nederland, of Amsterdam, and is, with the

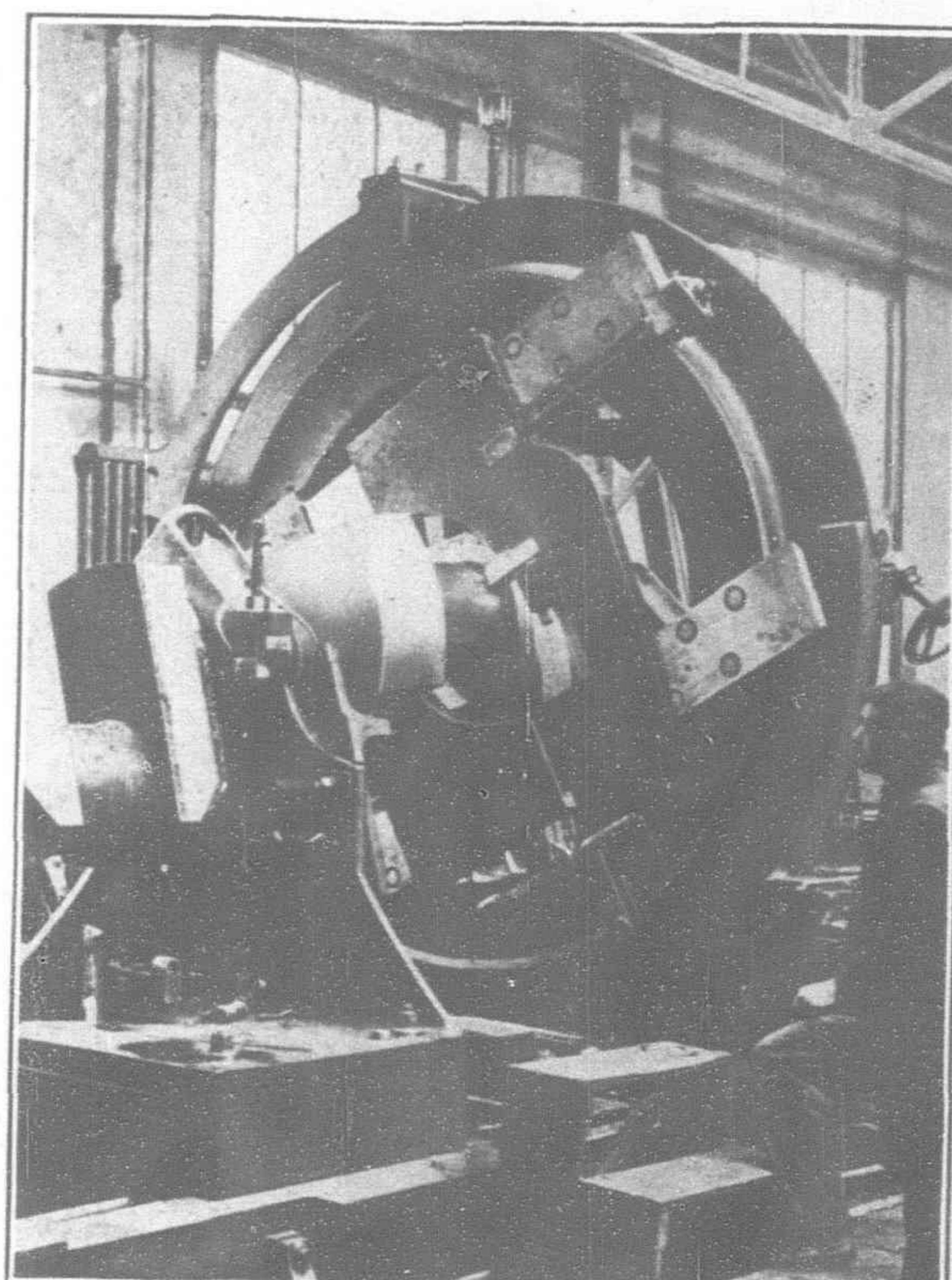


Fig. 6.—The Moll Apparatus for Machining Crankpins

engine to be seen in the middle of the shops, intended for the twinscrew passenger ship *P. C. Hooft*. This ship is being built by the Ateliers et Chantiers del la Loire, St. Nazaire. In the front of the left, can be seen two 520 b.h.p. direct reversible marine Diesel engines; behind to the left, the frames for two marine engines with a total output of 2,300 b.h.p. To the right, beside them, as already mentioned, is another eight-cylinder 4,000—b.h.p. Sulzer marine Diesel engine, which is practically completely erected and will soon be on the testbed. To the right can be seen the columns of a 3,600 b.h.p. land engine. This has six working cylinders and is intended for the Shanghai Electricity Works, where Sulzer Diesel engines with a total output of 6,600 b.h.p. are already at work. The engines to be seen in this illustration have a total output of 14,940 b.h.p., which will allow of an idea to be formed of the scale on which Sulzer Diesel engines are being built.

Passing through the Sulzer works, the impression is obtained that these shops are thoroughly up to date in their equipment. The buildings and the machine tools are suited for turn-

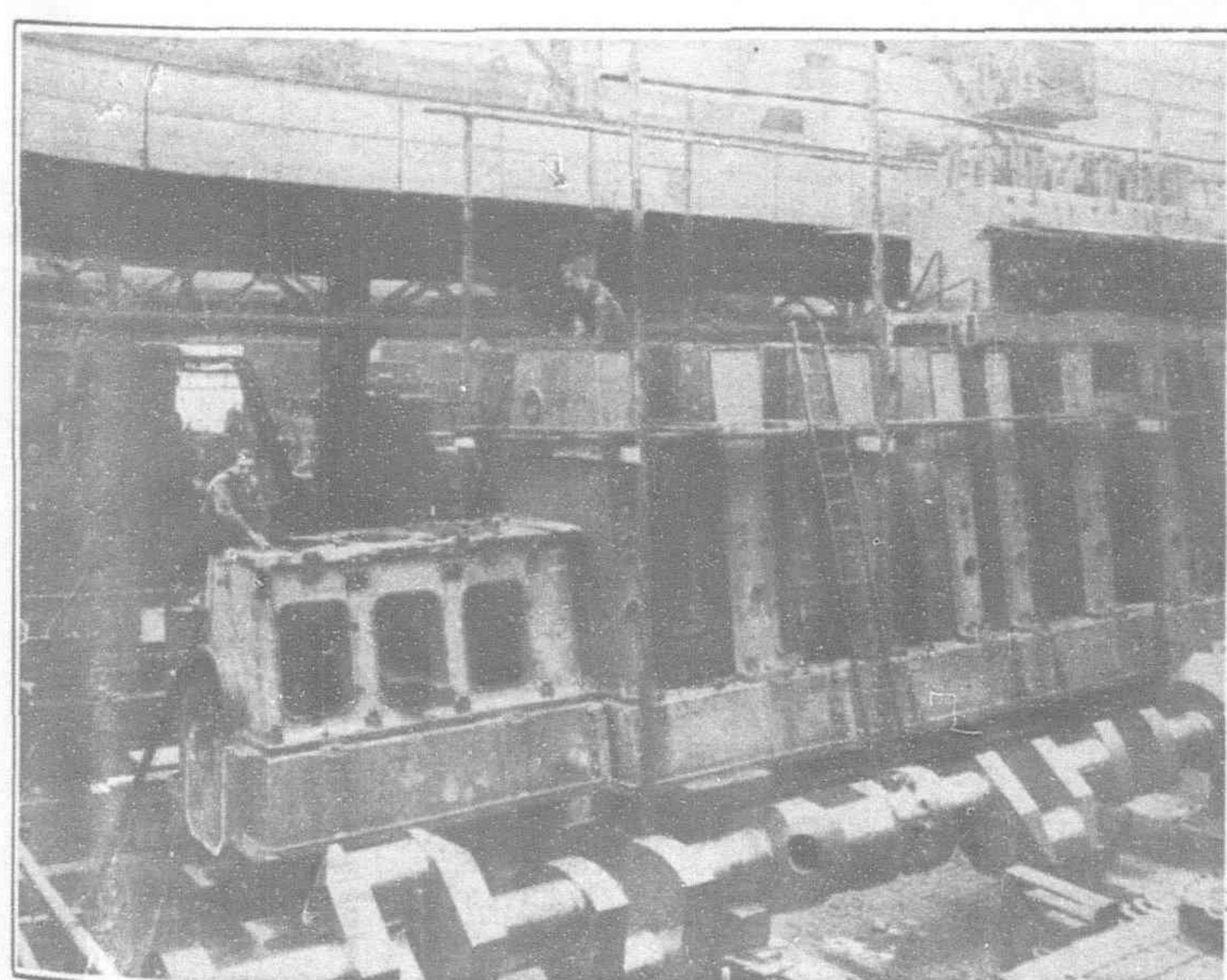


Fig. 12.—A 3,600 B.H.P. Engine with Erection Half Finished

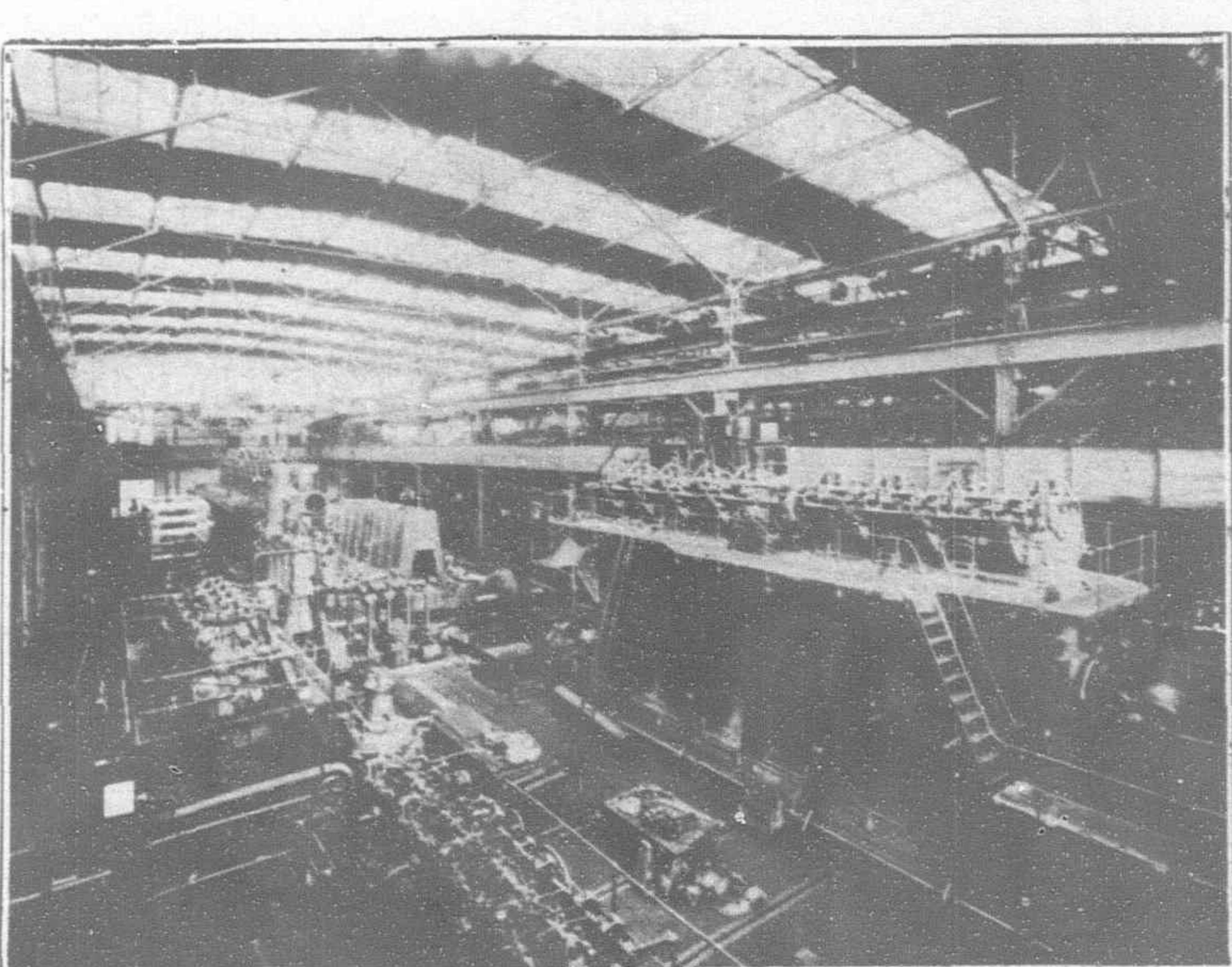


Fig. 14.—A View of the Shops

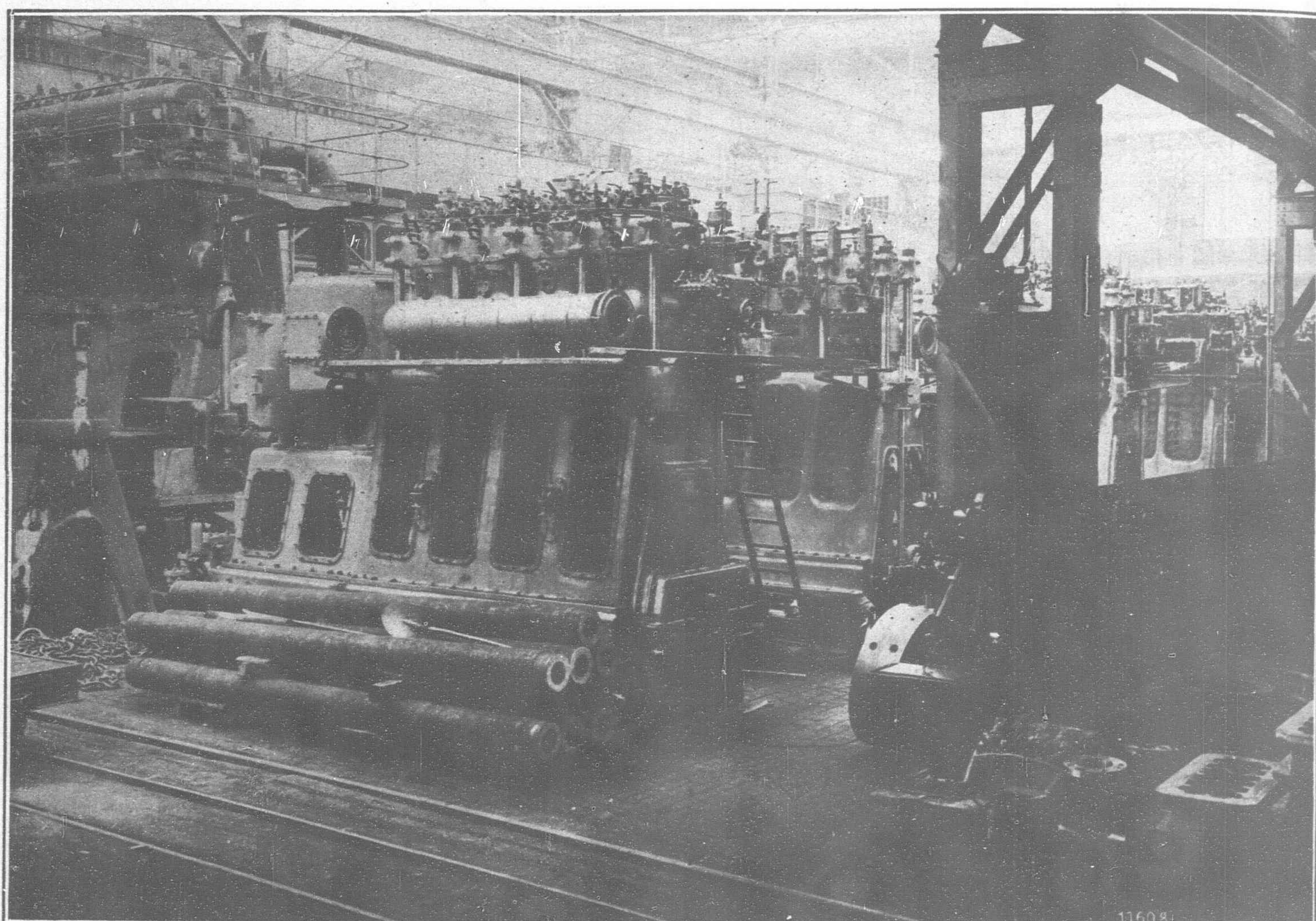


Fig. 13.—A Bay Used for Erecting Medium Sized Marine Diesel Engines

ing out first-class work. A keen, orderly activity prevails everywhere throughout the large buildings. The numerous different types of engine under the construction is a very striking feature; including quite small engines of 20 h.p. and less, a suitable type can be found here for almost any conceivable purpose, whether for stationary

or marine work, or for the propulsion of vehicles. The most outstanding feature perhaps is the size of some of the engines. At present there are many large Diesel engines for ships propulsion and electric power stations under erection or on the test beds, one of them an engine of 7,000 b.h.p.

A Record Trade Year for Dairen

BOTH the volume of trade and the amount of revenue collected for the year under review were the largest on record, says Mr. H. Kishimoto, Commissioner of Customs for Dairen, in his 1925 report. The total value of trade was 284.4 million Haikwan taels, as compared with 249.2 million Haikwan taels in 1924. The increase was mainly in the coastwise trade, especially in exports, which rose from 19.3 million Haikwan taels in 1924 to 42.4 million Haikwan taels. Owing to bumper crops last year and a brisk export of staple produce, the farmers in the interior were eager to buy. The boycott movement in South China naturally affected the coast trade, but, as it happened in the slack summer season, its effect was comparatively unimportant. In the case of imports from Japan, an increase was even observed during the strikes, on account of the rise in Shanghai market prices combined with a favourable rate of exchange. In view of anticipated good crops again during the year under review, it was hoped in the autumn that the year would end with a further advance in import trade, when, however, war broke out in Kiangsu and spread to Manchuria. Mukden notes fell steadily and, at one time, were quoted as low as 234.50 for 100 gold yen. This fall in Mukden notes, coupled with popular uneasiness in Manchuria, resulted in a temporary cessation of transactions with the interior. Local Chinese merchants were, in many cases, unable to take delivery of cargo imported under forward contracts, and there was, towards the end of the year, a tremendous accumulation of import cargo, mostly flour, at Dairen. Luckily,

however, normal conditions were soon restored, and the adverse effects of the civil war on the trade of this port were not so disastrous as they might otherwise have been. In the export trade especially, no evil effect was felt. At first it was feared that the farmers would not bring their staple products to the stations along the South Manchuria Railway. On the contrary, repeated disturbances taught them that it was safer to dispose of their stock as soon as possible before carts were commandeered by the troops. Consequently, staple products continued to arrive by rail even during the trouble, and their prices fell gradually towards the end of the year. The following table shows in millions of Haikwan taels the gross value of the direct trade of the port with foreign countries as compared with that for the previous year and that for 1913, the record year before the Great War:—

	1913			1924			1925		
	Im- ports	Ex- ports	Total	Im- ports	Ex- ports	Total	Im- ports	Ex- ports	Total
Hongkong ...	0.41	0.77	1.18	2.44	1.87	4.31	2.33	2.31	4.64
Dutch Indies ...	—	0.13	0.13	1.21	4.14	5.35	1.25	4.89	6.14
Europe ...	3.26	2.17	5.43	11.59	25.78	37.37	10.06	25.41	35.47
Korea ...	1.07	1.54	2.61	0.54	0.77	1.31	0.59	1.25	1.84
Japan ...	21.79	24.14	45.93	38.52	86.56	125.08	48.54	85.49	134.03
United States of America ...	1.45	0.13	1.58	18.94	5.12	24.06	12.29	7.80	20.09
Other Countries	0.76	1.13	1.89	3.92	1.46	5.38	2.93	2.05	4.98
Total ...	28.74	30.01	58.75	77.16	125.70	202.86	77.99	129.20	207.19

Fast Motorships in Far Eastern Trade

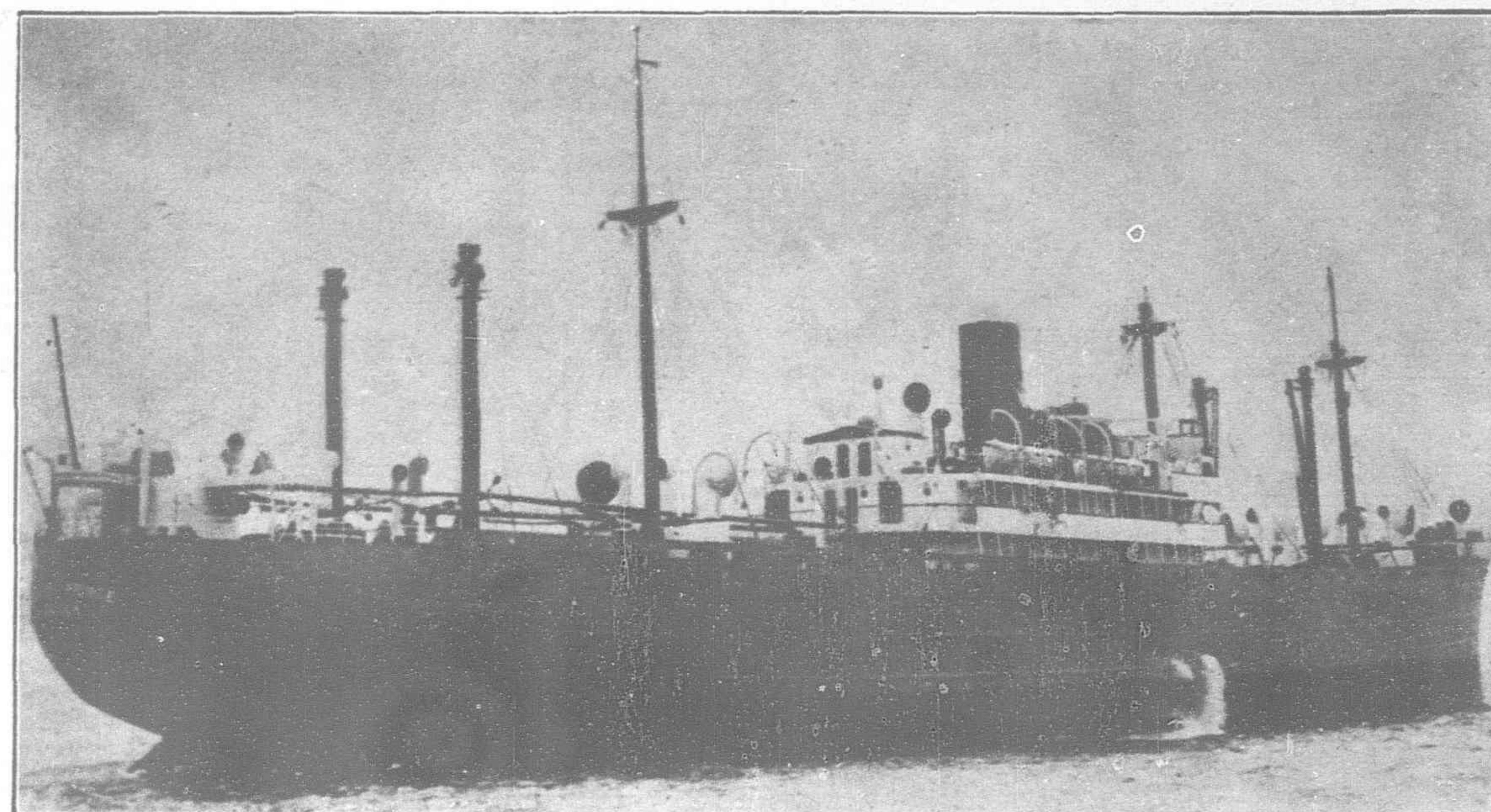
Prince Line's New 14½ Knotters Cut Time from New York to Far East by 7 Days

FURNESS WITHY'S five new 10,000 ton, 14½ knot twin screw cargo motorliners for the Prince Line New York-Far Eastern service definitely mark the advent of the fast motor freighter which must eventually run the slower and more expensive steamer out of business. Sailing from New York on March 25, Malayan Prince, first of five new German-built motor cargo liners reached Yokohama on schedule in the reasonable time of 35 days. Keeping well within her schedule she returned to New York on July 20, thus completing her maiden round-the-world trip in 119 days. The average speed for the whole distance works out at slightly under 14 knots which is very reasonable when the vicissitudes of a trade such as that in which Malayan Prince is engaged are taken into account. On her trial trip, when light, a speed of nearly 16 knots was recorded and at certain periods of the maiden voyage 15 knots were logged. Weather conditions at other periods were responsible for reducing the speed to 13 knots. Monsoon, typhoon, Atlantic gale—these are all factors which have to be taken into account when fixing the maximum sea speed for a ship for this branch of Far Eastern trade.

Malayan Prince ran her trial trip and left almost immediately for New York where, after a stay of only a few days, she commenced her maiden voyage calling at the ports shown in the schedule and staying only sufficient time to load and discharge cargo. Except for attention to minor repairs therefore, there has been no chance of taking down the main engines until her return to New York. They have run steadily with an average all-purpose fuel consumption of 25 to 25.7 tons of Diesel fuel oil and 37 gallons of lubricating oil per day. This, of course, is a maiden voyage result which will without question be improved on the next voyage. It is also anticipated that the schedule will be shortened. Javanese Prince, the second ship, left New York on April 20 arriving at Yokohama 2 days ahead of her schedule and about 7 days ahead of steamers employed on this service, until the advent of the new motorships. The remaining units of the new fleet left at regular intervals after this and are now all in service.

Chief Characteristics of Prince Line Motorships

Length, b.p.	441-ft. 9-in.
Beam, molded	60-ft. 0-in.
Depth, to shelter deck	42 ft. 3-in.
Draught	27-ft. 6-in.
Gross register	6,376 tons
Deadweight capacity	10,000 tons
No. of holds	5 & 1 deep tank
Speed (loaded)	14½ knots
Length of motor room	59-ft. 6¾-in.



"Malayan Prince," First of Five Large Prince Line Motor Freighters, Recently Returned to New York After Her Maiden Round-the-world Voyage

Japanese Prince and Chinese Prince are vessels of shelter deck type with a short forecastle and a midship house which has accommodation for the crew, at shelter deck level, and for the engineer and navigating officers and eight passengers on the next deck above. Above this again is a boat deck. There are two tiers of 'tween decks. All deck auxiliary machinery is electrically driven, and thirteen 5-ton and four 3-ton winches take care of the cargo. In addition, there is one 30-ton and one 40-ton derrick for handling heavy lifts. A stack of normal size takes the main engine exhaust and the profile is completed with a straight stem and a cruiser stern.

The vessels are powered by 2 sets of 8-cylinder A. E. G.-B. & W. engines with cylinder diameter 89½-in. by 47-in. stroke, developing collectively 5600 b.h.p. at 125 r.p.m. These engines are designed to give the ship when loaded to full capacity a speed of 14½ knots. An exhaust gas heated boiler, with a working pressure of 50 lb. per sq. in. is arranged on the port engine exhaust system. There are three auxiliary generating sets, each driven by a 3-cylinder 150 b.h.p. A. E. G.-B. & W. trunk piston engine, supplying current for the deck and engine room auxiliary machinery, and these operate in port to supply the necessary current for the deck auxiliaries.

Their designed loaded speed of about 14½ knots is faster by 2½ to 3 knots than any other motorship at present employed in the New York-Far Eastern trade and faster than the majority of steamers. Considerable interest was manifest when Furness Withy last year, passing over British shipyards on account of their higher bids, went to the Deutsche Werft, Hamburg, with orders to construct five high class freight carrying motorships of 10,000 tons deadweight capacity and 14½ knots speed. This speed in itself was something of an innovation because even as recently as last year very few purely freight motor vessels of over 12½ knots speed were being built. It was realized by the owners, however, that shippers at the present time in certain trades are demanding speedy transit for their freight, and that generally speaking the faster ship gets the better class freight to handle. For a similar cargo carrying capacity, the motorship, other things being equal, can be designed with a higher speed than a steamer. With the steamer an increase in speed of a few knots may conceivably require an increase in overall dimensions owing to the increased size of machinery and bunker space. The motorship, however, requires a smaller space both for machinery and fuel. Furthermore, a 14½ knot motorship burns only 23 to 25 tons of fuel oil per day as against the 75 tons of the steamer.

Malayan Prince and her sister-ships Asiatic Prince, Javanese Prince,

Malayan Prince Maiden Voyage Schedule

Port	Date	Days from N.Y.
New York A.	March 15	—
New York S.	March 25	
Hampton Rds. A.	March 26	1
Hampton Rds. S.	March 27	
Colon A.	April 2	8
Panama S.	April 2	
Los Angeles A.	April 11	17
Los Angeles S.	April 12	
Yokohama A.	April 29	35
Yokohama S.	May 1	
Kobe A.	May 3	39
Kobe S.	May 4	
Shanghai A.	May 7	43
Shanghai S.	May 10	
Hongkong A.	May 13	49
Hongkong S.	May 13	
Manila A.	May 15	51
Manila S.	May 18	
Ilo ilo A.	May 19	55
Ilo ilo S.	May 21	
Cebu A.	May 22	58
Cebu S.	May 23	
Sourabaya A.	May 27	63
Sourabaya S.	May 28	
Samarang A. & S.	May 29	65
Batavia A.	May 30	66
Batavia S.	June 2	
Singapore A. & S.	June 11	77
Penang A.	June 15	82
Penang S.	June 16	
Suez A. & S.	July 1	98
Port Said A. & S.	July 2	99
Boston A.	July 17	115
New York A.	July 20	119

Prince Line plans to maintain its five new motorships on a round the world service from New York back to Boston and New York via Newport News, Panama Canal, Los Angeles, Yokohama, Kobe, Shanghai, Manila, Sourabaya, Samarang, Batavia, Singapore, Penang and Suez. General cargo, comprising such commodities as machinery, flour in bags, lubricating oil, cotton, tobacco and cigarettes is carried outwards from New York and Newport News and unloaded at all ports up to Manila, which marks really the end of the outward portion of the voyage. The return cargo, picked up partly at the unloading ports and partly at the ports of call in the Dutch East Indies and the Malay Peninsula comprises tea, sugar, rubber, Chinese groceries—a generic term for foodstuffs imported for Chinese resident in the United States comprising anything from a 1000 year old egg to edible bird's nests—pepper, spices, rattans, bamboos and rubber.

Malayan Prince carried from Manila to New York 860 tons of coconut oil in her deep tank. This liquid cargo is not handled by the ship pumps in any way but is loaded and pumped out by shore people. It must be at a temperature of about 110 deg. Fahr. before it can be unloaded.

The forward and aft peak tanks of these ships are fitted with special pumps and pipe lines to enable them to load and discharge liquid rubber or latex, as it is called.

It is evident, although it is as yet early days, that these new motorships are making large inroads upon the Far Eastern trade. The effect of their presence must be felt even by rival motorships because the new ships are offering to shippers something which is definitely faster than anything at present on the route. This is a powerful weapon in the hands of the owners since they can, and do, advertise their service as "an improved service—which will be further improved upon," a conservative schedule having been purposely adopted for the start. As far as rival steamers are concerned, the owners of the new ships have the pull of offering to shippers something which is the latest and most modern in every way—a psychological pull of some value. Following is a table giving the ports of call and scheduled times for the new Prince liners. This takes care of the outward journey as far as Manila and is expected to be improved on as the new ships settle down into routine working conditions.

Prince Motorliner Schedule

Port	Days Taken.
Yokohama	35
Kobe	39
Shanghai	43
Hongkong	49
Manila	51

Dates of arrival and departure of Malayan Prince on her maiden voyage are also shown. It will be noted from this that she made the Atlantic and Mediterranean "leg" of the voyage in very reasonable time. Very little, if any, falling off in speed was noticed which could be attributed to foul bottom conditions, and such falling off might quite well be expected after a lengthy round the world voyage. This is to be attributed to the higher speed at which this particular ship operates. It is one of the advantages of the high speed freight motorships compared with a slower steamer or even a slower motorship.

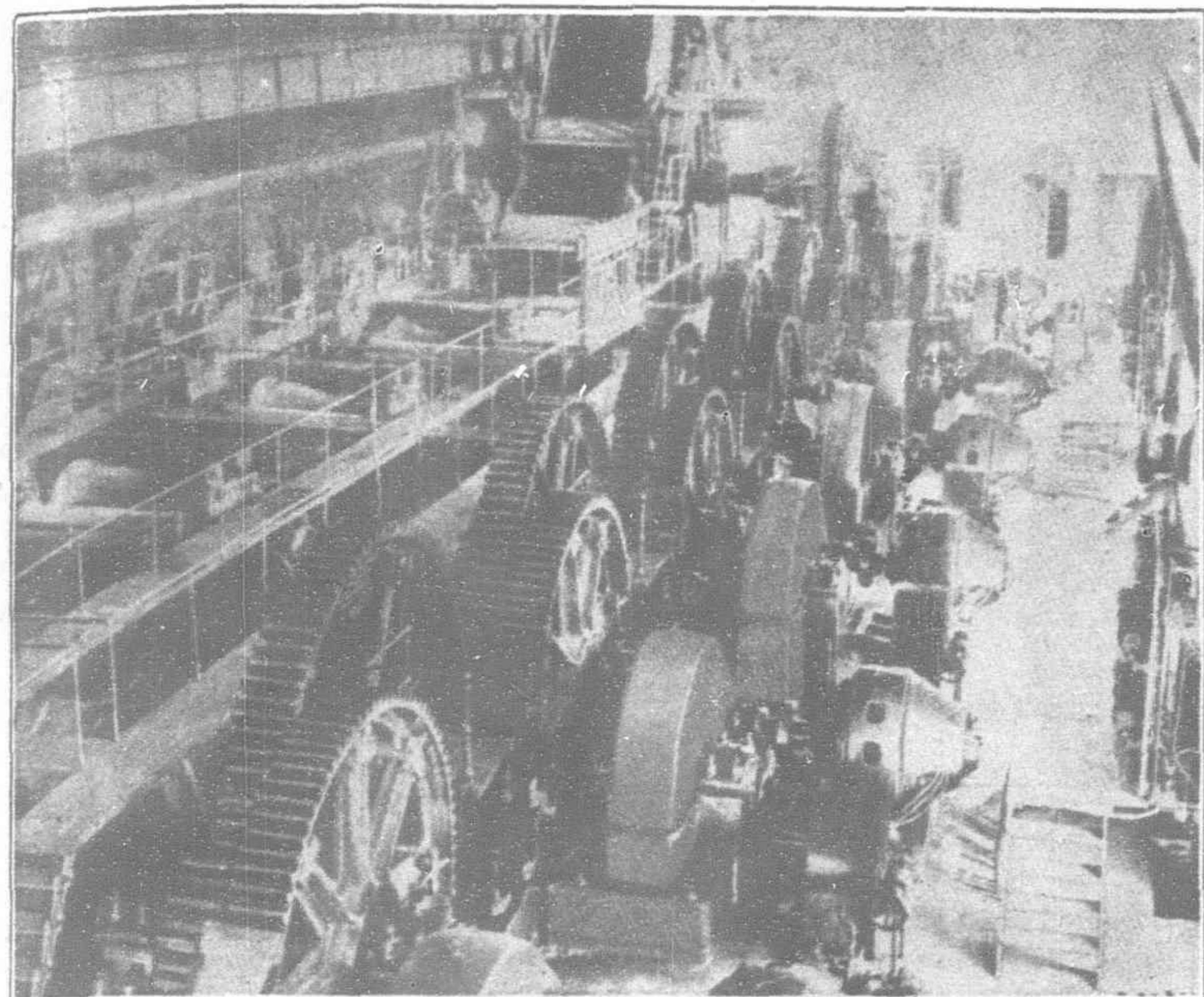
Fueling for the round trip New York to New York is carried out four times. Sufficient is taken on at New York to take the ship to Los Angeles, a second quantity loaded at Los Angeles lasts until Singapore is reached, while the amount taken on at Singapore carries over as far as either Port Said or Gibraltar, a final load being taken at one of these two ports.

Among other lines operating in round the world services running out to Far Eastern ports and home via Mediterranean may be mentioned the Kawasaki-Roosevelt Line, agents for whom are the Kerr S. S. Co., Inc.; the Dollar Line, and the Barber Steamship Lines, Inc. The Bank Line runs out to Far Eastern ports with 11 knot motor freighters, but these ships generally return to New York via the Pacific. Each of these has a slightly different itinerary and schedule. Kawasaki-Roosevelt Line maintains a joint motorship-steamer service, using the 6 motorships of the Silver Line Ltd. in conjunction with steamers of the Japanese "K" Line. Silver Line fleet comprises 3 Doxford-engined and built ships of about 8,000 tons deadweight capacity and 10 knots speed, 2 Swan Hunter-engined and built ships of 8,600 tons deadweight capacity and 11 knots speed, and 1 J. L. Thompson-built and Doxford-engined ship of 7,900 tons deadweight capacity and 11 knots speed. Silver Line has now under construction 6 motorships of 9,000 tons deadweight capacity and 14½ knots speed, which are expected to be ready for service by the end of the year. Prince Line will then have to face the competition of new ships, just as fast and of practically the same cargo capacity, as its new ships. Dollar Line round-the-world fleet comprises four 535-ft. Shipping Board liners of "President" type. These are passenger and cargo steamers of about 13,000 tons deadweight capacity and 15 knots speed, having accommodation for over 400 passengers. There is probably very little difference in the respective cargo carrying capacities since the fuel capacity of the steamer in proportion must be considerably larger than that of the motorship. The fuel consumption of a steamer, too, is unquestionably higher than that of a motorship. In fact, there is no doubt that the large steamers will have to be run very economically and their operation carefully watched in order to compete successfully with the new motorships, where cargo is concerned.

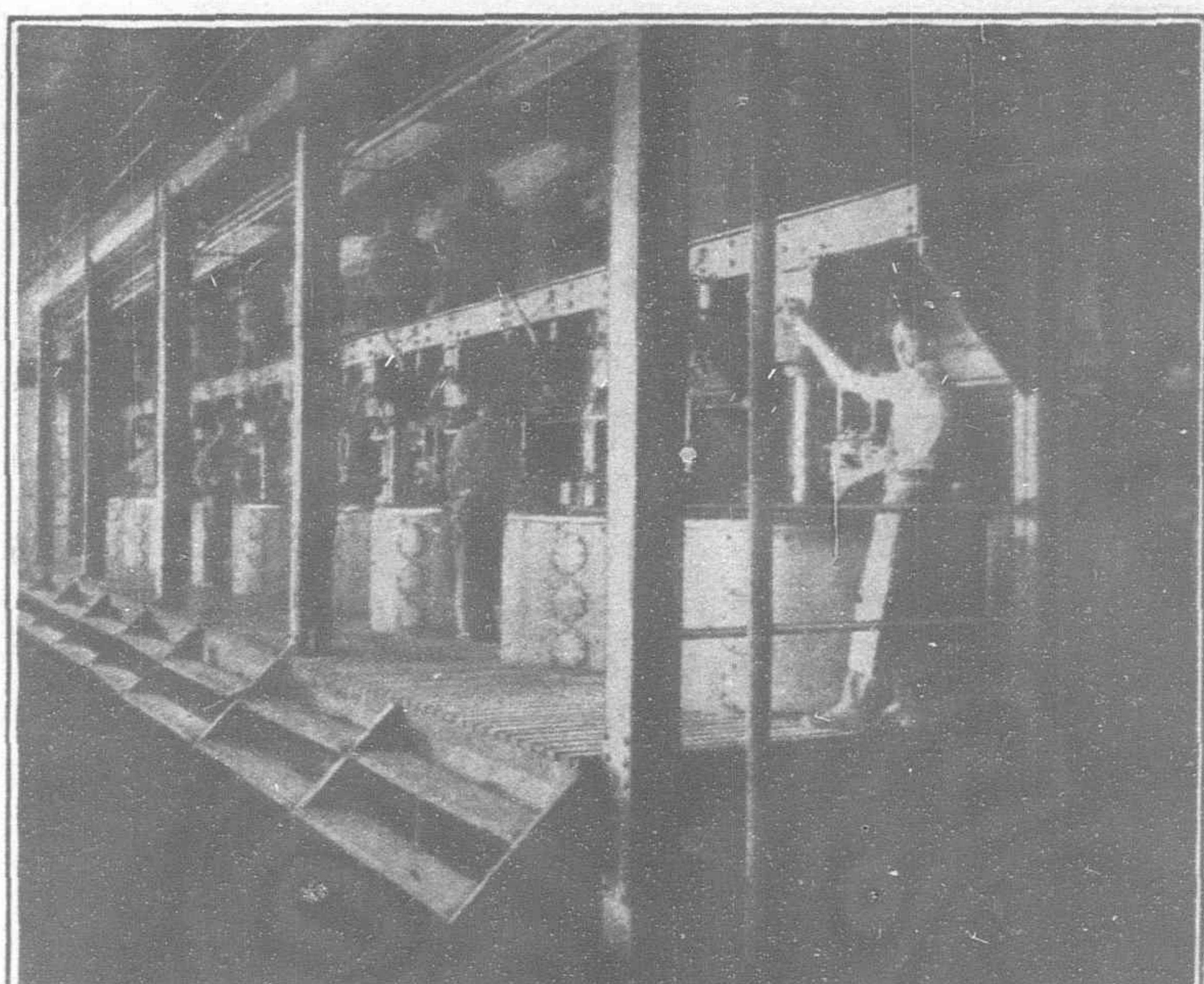
Following is a table showing the difference in the schedule followed by the three principal round the world routes. It will be seen that the Dollar Line omits the Dutch East Indies calls.

Shakako Telephones to be Replaced with Automatics

The replacement of the Shakako telephones with automatics is to be finished during the current fiscal year. Already the construction of necessary buildings is in progress. The telephone office, Shakako, on the completion of the replacement work, is to be transferred to the control of the Dairen Telephone Exchange as the Shakako branch. The jurisdiction of the Dairen Central Exchange and the Shakako branch exchange is to be divided by a boundary line running from north to south at the west of Shokoshi (Chinese Quarter). On this account, about 20 subscribers now belonging to the Dairen Exchange in the west of the boundary line will be transferred to the Shakako jurisdiction simply with a change of telephone numbers.



Westinghouse type CW wound rotor induction motors driving crusher rolls, Central Mercedita, Melena del Sur, Cuba



Westinghouse type CS Motors driving 48" centrifugals in the Washington Station of the California-Hawaiian Sugar Refining Company plant

Electricity in the Development of the Sugar Industry

By C. B. Gibson

SUGAR cane, as many other of our cultivate plants, originally came from India. It seems to have thrived there from time immemorial. From India, it was carried eastward and westward until to-day sugar cane is grown throughout the world wherever soil and climatic conditions permit.

The natives of India and of the Pacific Islands, where it was carried from India, cultivated sugar, simply to eat the cane and drink the juice. They had no idea of the manufacture of sugar; the Persians were the first people to actually make sugar.

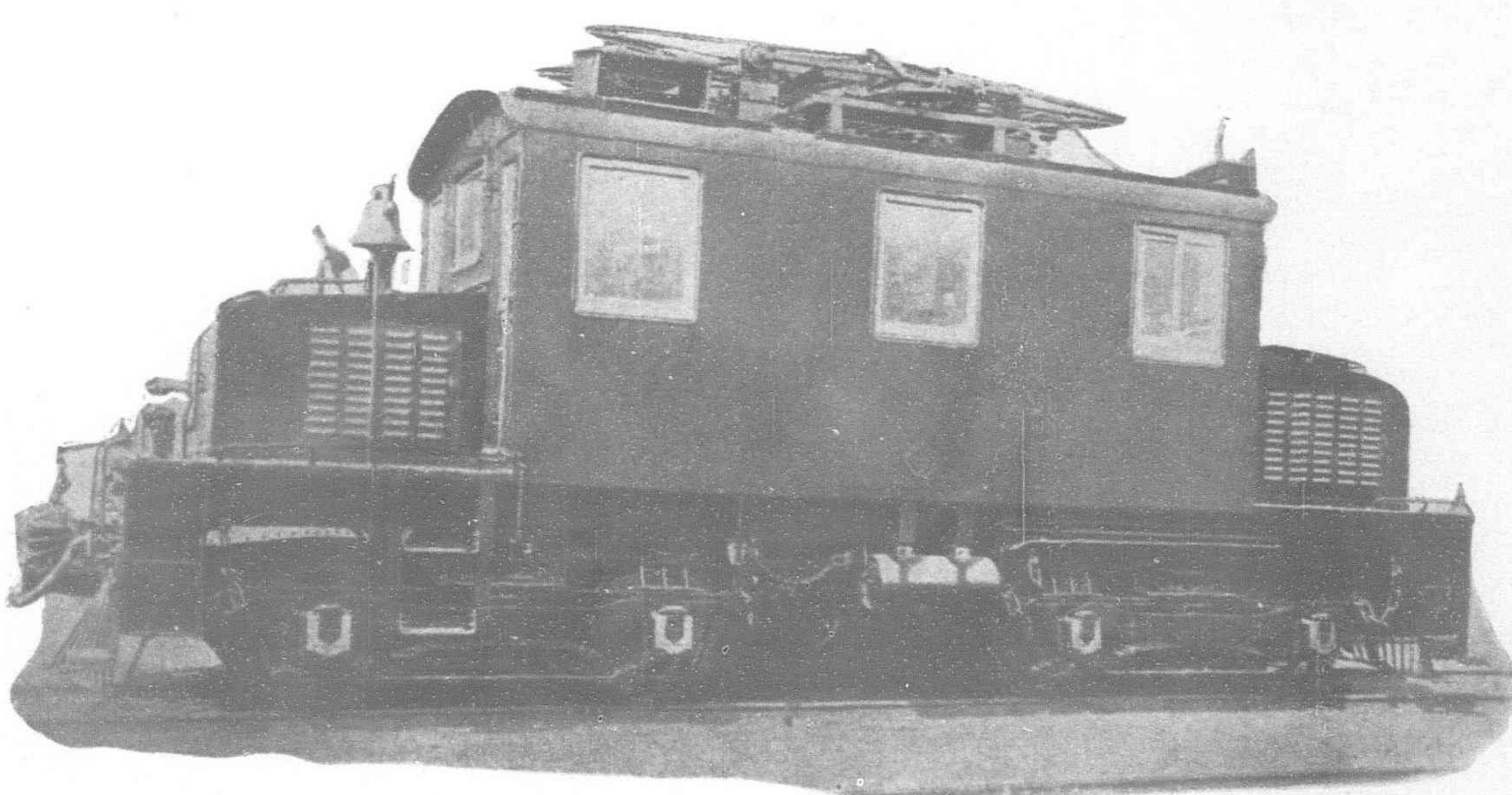
The early method of sugar making as practiced by the Persians and the Arabs was quite primitive as compared with the methods employed to-day, although the essential stages were the same. First, came the crushing of the stalks, then, the expression of the juice, the evaporation, and the crystallization and separation of the sugar. The improvements that have been made in the past one hundred years have been greater than those in all the time previous to this period.

Hand and water power were the original sources of energy employed in sugar making. Next, steam power came into use, the steam engine taking an important part in sugar mill drive for many years. To-day, the larger and more modern sugar mills are electrically driven.

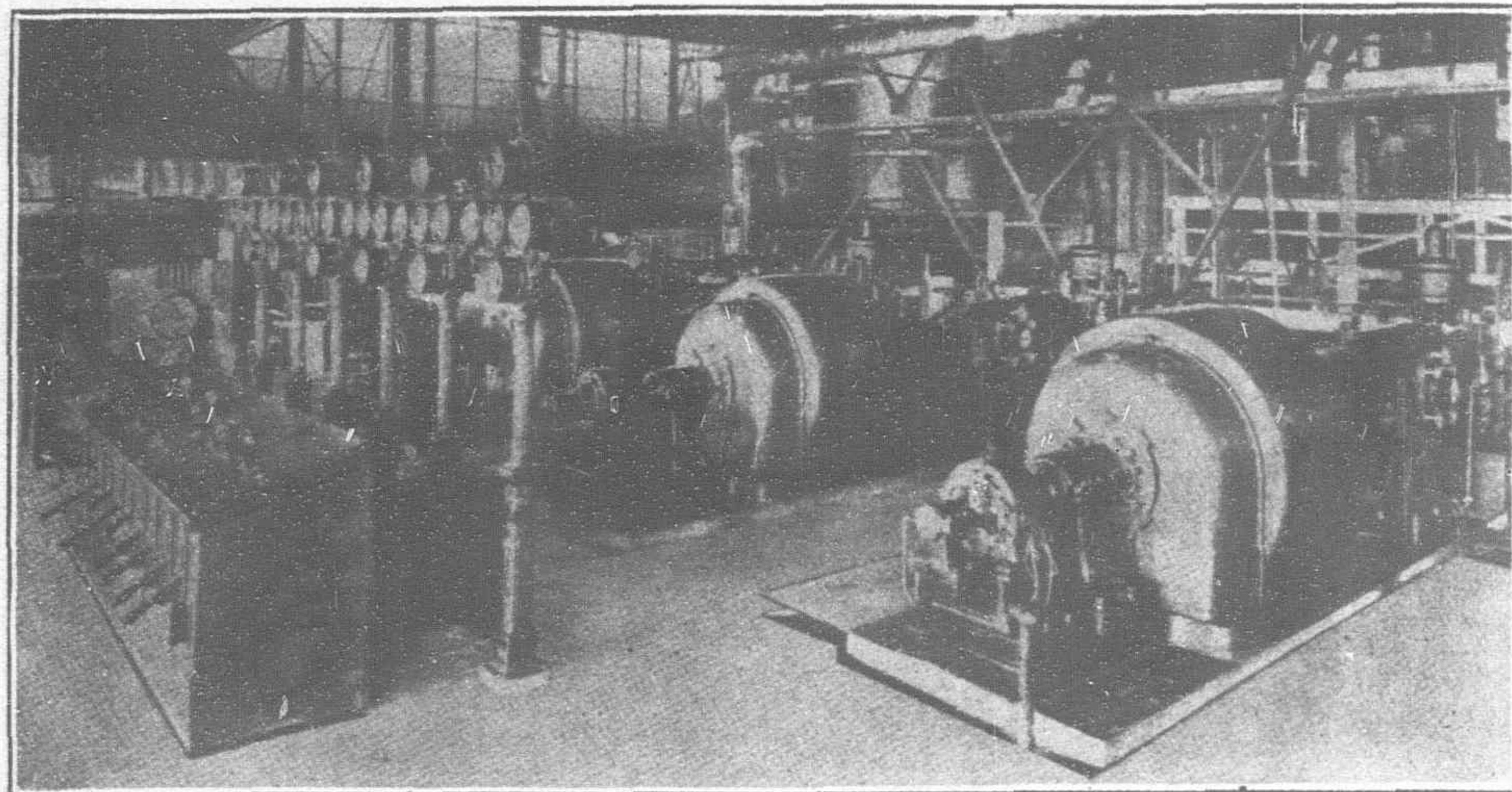
The transition from steam to electricity was slow. The electric drive was looked upon as being impracticable, since steam is required in certain steps of sugar making. The arguments, that as long as it was necessary to generate steam, the steam engine was the practical form of drive, was finally overcome and some of the larger and more important mills were convinced of the many advantages and savings in cost of operation, effected by the use of electricity.

A brief discussion of the methods employed in the manufacture of sugar as carried on to-day will here be given.

When the sugar cane has reached the proper degree of ripeness, the cane is stripped, cut and hauled to the mill. The cane, if grown at a considerable distance, is hauled by train. The cars are unloaded



Electric locomotive built especially for cane haulage



Power House of Central Amistad

mechanically, and the cane, carried by an incline conveyor, is fed into two large rollers which form the crushers. This reduces the stalks to a pulp and extracts a large amount of juice which is carried away. The pulp then passes to the first mill, which consists of powerful rollers—two below and one above. From here it is conveyed to a second and third mill, and in some cases to a sixth mill, depending upon the amount of maceration.

As the cane advances from mill to mill the pressure on the rolls is gradually increased hydraulically. When the fibre leaves the last mill, it usually contains from forty to fifty per cent. of moisture with a small residue of unextracted sugar. The best mills will extract over ninety-five per cent. of the sugar content.

The extracted juice from the crushers and mills is then pumped into tanks called defacators, where it is treated with milk of lime to remove the acidity. Afterwards it is treated by boiling—by means of steam coils. This causes the lime to combine with the acids of the juice, forming insoluble compounds, and coagulating the albuminous matter. A flocculent precipitate forms, part of which rises to the surface, forming a scum, and part of which settles at the bottom. After a while, the clear juice is drawn off and the scum and sediment is put through filter presses. The running from the presses is added to the clear liquid.

The juice is next evaporated in the multiple effect to a syrup, and is further concentrated in the vacuum pans where it forms

a thick mass of crystals—*masse cuite*. This is then carried to the centrifugals by which the sugar is separated and the molasses run off.

The sugar is now dumped from the centrifugals into conveyors which carry it to chutes where it is loaded into bags and shipped to the various refineries.

After reaching the refineries the raw sugar is emptied from the bags into vessels. Water is added and the mixture kept agitated until it is reduced to a syrup. The syrup is then passed through eliminators where it is heated by live steam and bleached with sulphur dioxide. The liquid is then passed through filters which clarify it. The juice is further clarified by being passed through another filter, usually of charcoal, after which it is ready for the vacuum pans, centrifugals, and dryers. The treatment in the centrifugals is the same as with the raw sugar described above.

The great progress in sugar manufacturing has been effected by the use of better appliances, better drives, and by better chemical control.

For a number of years electricity and electrical machinery have been a considerable factor in effecting economy in the manufacture of sugar, providing the public with this necessity at a reasonable price.

Many advantages were offered by the adoption of electric power in sugar mills. Electric drive has made it possible to effect economies in building construction, because of the comparatively light weight of the motors, small space required, and the ease of running electric power circuits to any part of the mill. Machines can be located exactly where they are best suited in the process of manufacture. Attendance is reduced to a minimum through the use of control devices which automatically protect the motors and the machines they drive. Furthermore, control can be arranged to provide automatic starting or shutting down of machinery by the action of some factor in the process of manufacture.

Motor drive has improved working conditions by eliminating, to a considerable extent, shafting and overhead piping. Maintenance costs have been considerably decreased, as well as power losses arising from the use of belting and steam piping.

A few views are shown, giving an idea of the extent to which electricity and electrical machinery have been adopted in the larger and more modern sugar mills.

Two Million Dollar Building for Nippon Electric Co.

THE H. K. Ferguson Co., engineers and builders of Cleveland, have just started work on the construction of the first of four factory units of better than a \$2,000,000 industrial plant program for the Nippon Electric Co. at Tokio, Japan, according to announcement of R. E. J. Summers, chief engineer for the firm.

The enormous building program contemplates the eventual replacement of all of the old structures by modern three and four-story structures which have been designed under the direct supervision of Ferguson engineers who are credited with having developed the best possible earthquake resistive structures.

Prior to the great earthquake in Japan, the Nippon Electric Co. plants at Tokio occupied more than 4,500,000 sq. ft. of floor space. The great bulk of this space was either completely or in part destroyed during the earthquake, and the plant has since been operating in what remained of the old buildings or in temporary structures, pending the start of the new building program.

Two years ago Mr. Summers was called to Japan to serve in a consulting capacity with Japanese designers to arrange for the rebuilding program. In this connection his supervision brought about design of structures which would provide maximum of earthquake resistance.

In May the contract for the construction of the first of four units of the plant was awarded and now actual construction is under way. Foundations have been started for the mammoth unit, which is to be in part three and in part four floors.

Contracts call for the completion of the unit by next February. It is then planned to move part of the operations into the new buildings so that others of the old group may be torn down and the second unit erected. This same policy is to be followed all of the way through until the work is entirely completed.

It is said that in an important measure, the success of the H. K. Ferguson Co. in the design and the erection of the \$3,000,000 plant for the Shiabaura Engineering Co. was responsible for the turning to this American firm by the Nippon Electric Co. The Nippon company is affiliated with the International Standard Electric Co. of New York, and prior to last September had been the Japanese branch of the Western Electric Co.

The electrical industry structures to be erected in Tokio are to be of heavy structural steel frame of special earthquake resisting qualities. An idea of the structure can be gained from the fact that more than 1,500 tons of structural steel will be used in the first unit.

In the construction of the three and four-story buildings concrete is to be used. The finish of the buildings is to be concrete, as are the floors throughout.

Special types of pile foundations suited to the soil conditions are being used. In this connection it is interesting to note that through the special engineering plan worked out, a saving of \$65,000 has been brought about on this feature alone.

As was successfully done in the case of the Shiabaura engineering job, Japanese workmen will be used almost exclusively on the building work. However, these workmen will be under the direct supervision of engineers of the Ferguson Co., who are either now stationed in Japan or who will be assigned from the American offices as the undertaking progresses.

Already two engineers from the company have been assigned to go to Japan to augment the force already there. T. H. Mitchell from the Cleveland office will go to Japan and serve as construction superintendent, while William Schatz is to be assigned to the Tokio work as assistant superintendent.

Engineering Notes

Cavite Sewage System.—A modern sewer and drainage system is to be constructed in Cavite, P.I. to be paid for by the issue of provincial bonds amounting to P156,000.

At present, lack of proper drainage facilities causes damage both to street and fields. The former plan of obliging each individual to construct his own septic well and drainage canals was found inadvisable by the district engineer.

State Housing Plan.—The Japanese government is now drawing up plans to settle the housing problem of Tokyo, Osaka, Kyoto, Kobe, Yokohama, and Nagoya, at a cost of Y.37,000,000 during the next 10 years. The scheme will be introduced in the coming session of the Diet and urged as one of the most important and imminent questions of the country and the Home Office will ask for approximately Y.1,200,000, from the Finance Office to cover the expenditures for the next fiscal year.

The housing problem will be settled by the municipal authorities, which are to obtain the government's subsidies annually in order to carry out the plan, according to the act which provides that unhealthy and rotten houses will be removed from the city or the slum quarters improved in order to improve general health conditions.

New Power Plant, Japan.—Following an understanding with the Ministry of Railways regarding the sphere of riparian rights. The Shin-etsu Electric Power Company, a subsidiary of the Tokyo Electric Light Company, has voted to raise funds to erect a new plant along the River Shinano at a cost of about \$90,000,000 spread over a period of five years. The paid up capital of Y.32,000,000 is to be increased by Y.12,500,000 (a quarter of Y.50,000,000 to be nominally increased) to a total of Y.44,500,000. Then debentures are to be sold gradually to cover the remaining amount.

Work is to be started the early part of next year.

New Taxi Co., Osaka:—A scheme is being materialized by the managers of the inter-urban electric railway companies to operate city buses connecting all the inter-urban tram terminals.

Mr. I. Okada, of the Nankai Line is the chairman of the committee to study and outline the plan. It is understood that, if the plan be carried out, the company to be formed jointly by the inter-urban electric railway companies will be able to cut down the present fare by almost one-half. The new company has yet to decide whether or not it will buy the Osaka Motorbus Company. It is understood that the taxi company when organized will run cars especially between the terminal stations in Osaka, so that it will be easier for passengers to pass through the city from one suburban line to another.

Osaka's New Broadway.—Work on Osaka's new Broadway leading from Umeda Station to Namba was started on October 8 with a suitable ceremony.

The road, 144 feet wide, will have a 20 feet central section for tramways with 18 feet on both sides of it for motorcars, and another belt of 18 feet for cart traffic, and pavements of 18 feet. Trees will be planted in four rows between the pavements, the belts for high-speed cars and carts. Electric light of artistic design will likewise be installed along the whole route.

Its construction between Umeda Station and Umeda Shimmichi Crossing is to be finished within the present year, and the other sections leading to Namba Station by 1933.

The removal of the houses, improvement of the tramway tracks and underground work in connection with drainage and water mains in the first section have already been done.

Osaka City Motorbus Scheme.—It is expected that there will be much opposition to the plan of operating motorbuses in Osaka by the Municipal Office when it comes before the City Assembly. The plan was drawn up by Mr. Kimura, chief of the traffic section of the Municipal Office, and recommends the use of Woolsley

cars to seat 18 passengers. These cars are manufactured by the Ishikawajima Works of Tokyo and their purchasers obtain a bonus from the War Office.

Paper Mill Extensions, Japan.—The Oji Paper Mill, Fuji Paper Mill and Karafuto Kogyo Kaisha, the three largest Japanese mills, are planning to increase equipment and production within three years. If these plans are realized, the capitalization of the Fuji interests will be increased to Y.77,000,000 and annual production to 450,000,000 pounds, that of the Oji interests to Y.60,000,000 with the annual production of 400,000,000 pounds and that of the Karafuto Kogyo to Y.70,000,000 with an annual production of 200,000,000 pounds.

Flour Mills Won't Pay Freights on Shipments.—The Nissin and Japan flour mills have announced that hereafter the railway freight of seven sen on each bag of flour must be borne by the consignee. They have further agreed not to sell for less than Y.4.20 a sack.

As a result of this announcement, the spot price, quoted at Y.4.01 at the beginning of the month, has jumped to Y.4.15. October delivery has gone up to Y.4.13 and December delivery to Y.4.15. The tone of the market is firm.

After November 25, according to the mills, which have merged, they will no longer pay the five sen rebate on each bag.

The merger of these two companies is expected to have a favorable reaction on the market. It has already steadied prices.

The Tsuru brand of the Nissin Flour Mill, in the past, has been exported at a price five sen below that of the Japan Mill's Take brand.

The companies have now decided to export the cheaper flour and keep the better brand for home consumption. The combined production of the mills available for export is about 12,000,000 bags a year. Present exports amount to about 5,000,000 a year.

Railway Warehousing, Japan.—The Japanese authorities have decided to erect large warehouses near Nagoya under control of the Nagoya Railway Bureau during the next fiscal year. Land covering 1,900 tsubo will be purchased at Shin-Aichi near Nagoya. The building cost is Y.2,000,000. The expense of erecting other warehouses in other parts of Japan for five years beginning the next fiscal year is Y.10,300,000.

Bureau	Erection	Expenses
Tokyo ...	Shiodome and Sumida ...	Y.3,600,000
Kobe ...	Kobe, Osaka, Sakurajima ...	3,200,000
Nagoya ...	Shin-Aichi ...	2,000,000
Moji ...	Tairi ...	1,500,000
Total ...	...	10,300,000

S.M.R. Hotels.—The South Manchuria Railway Company will separate its hotel business and establish an independent company with a capitalization of Y.8,000,000, holding all the stock in its own hands.

Its railway hotels at Dairen, Hoshigaura, Port Arthur, Mukden and Antung represent an investment of about Y.6,000,000 and as they have an annual combined net operating loss of about Y.100,000, it is considered likely that the new company will be subsidized to that extent by the S. M. R.

This step is in line with the policy of the railway to make all its subsidiary enterprises legally independent. Gas and ceramics were separated last year and this spring electricity was divorced from the parent concern.

Government Coal Mining Combine, Korea.—A large coal mine combine in Korea is being planned by the Government General of Korea. The demand for anthracite coal has increased in recent years, and, exports last year totaled 620,000 tons, of which 359,000 tons were anthracite. Many mine owners in the peninsula, however, either suspended operation or discontinued, due to depression. The

Korean Government authorities had believed it necessary to effect a combine among coal mine owners to develop the industry in Korea and then establish a large coal mining company under official auspices.

The authorities will open negotiations with the Mitsubishi, Yasukawa, Kuhara, Heijo Electric, Chosen Kokyo and a few other mine owners. About 130 mines in the South Heian district are to be combined at first, according to the plan. The combine will be extended later to about 70 mines in the North Kankyo district.

Rail Orders, Japan.—Columeta, the sales organization for the Arbed-Terres Rouges group, of Luxembourg, has been awarded the order for 10,000 tons of 100-pound steel rails on which the Imperial Government Railways asked bids on September 17. This second order for 100-pound rails, is to be used in replacing the present 75-pound sections between Tokyo and Kobe.

The I. G. R. is planning to replace within five years all the 60-pound sections now in use with 75-pound rail.

Bids are being asked for 55 miles of 100-pound steel rails, about 10,000 tons in all, including splice bars, for the Kinhean electric line, near Osaka.

All Steel Railway Cars, Japan.—The recent railway accident on the Imperial Japanese Railway near Hiroshima has influenced the Railway authorities to have all new passenger coaches built of steel and estimates have been submitted for the construction of 720 new steel coaches during the next fiscal year at a cost of Y.32,000,000. Out of 650 coaches built this year in Japanese car factories, 190 have been of steel. Although most of this work will be done at the Government Railway Shops, a large proportion of the orders will be distributed to the private car builders of Japan. These companies are now enjoying considerable prosperity from the orders for all-steel cars placed by the Manchurian and Chinese railways. The Japan Rolling Stock Company at Nagoya has already completed and delivered several thousand tons of these cars and is planning to extend its manufacturing capacity in order to handle a larger volume of orders.

New Fertilizer Factories, Japan.—The Japan Artificial Fertilizer Company will erect a new 25,000 ton nitrogen fertilizer factory in Sasano, on the Kurobe River. The same concern has also purchased the Osaka Alkali Company, which intends to reorganize as the Osaka Alkali Real Estate Company, at a capitalization of 500,000 yen.

The Mitsui Bussan Kaisha, the Mitsubishi Shoji Kaisha and the South Manchuria Railway Company are planning jointly to establish a large soda ash company in the Kwantung leased territory with a paid-in capitalization of 15,000,000 yen. The Kwantung Government is to grant a subsidy for the enterprise in the budget for the next fiscal year.

There are now two soda ash plants operating in Japan, the Asahi Glass and Soda Manufacturing Company and the Japan Soda Ash Manufacturing Company, but they find themselves at a disadvantage in competition with foreign soda ash, due to the high price of salt here. Salt is handled as a Government monopoly and these concerns have repeatedly petitioned the Finance Ministry to reduce the price for them. Kwantung products last year were exempted from import tariffs into Japan.

Tokyo Electric Light Extension.—The Tokyo Electric Light Company, plans to increase its output by 1,000,000 new lights by the end of this year.

During the first seven months of the year, 562,000 new lights were installed increasing the total to approximately 5,500,000, and the new extensions will raise this to about 6,000,000.

At an average Y.7 per light, the company estimates an increased revenue of Y.7,000,000 a year.

Yalu Hydro-Electric Scheme.—A hydro-electric power plant with a 2,000,000 kilowatt capacity, to be erected with a capital of Y.200,000,000 somewhere along the Yalu River, is the new project which Mr. Tadasaburo Yamamoto, a Japanese business man, and Mr. Takema Machino, adviser to Marshal Chang Tso-lin, are now planning to carry out. The project includes the erection of a plant for magnesium alloys.

I. J. R. Electrification Plans.—Plans for the hydro-electric plants of the Ministry of Railways have been announced for the

next fiscal year. The new plants to be erected along the Shinano River will cost about Y.146,000,000 the work to be divided into four periods. The first, from 1927 to 1931, will include the construction of dams, reservoirs, aqueducts, sub-stations and high tension towers. The first three items, it is expected will cost about Y.32,000,000, the last two, Y.19,000,000. A capacity of 44,000 kilowatts is planned.

During the second period, from 1931 to 1934, the installation of the power plants with a capacity of 40,000 kilowatts will be carried out, at an estimated cost of Y.30,000,000.

The third and fourth periods, covering five years, and calling for Y.65,000,000 will be spent on connecting up power plants and electric systems and changing the character of the rolling stock. A bill embodying these points is to be submitted to the Imperial Diet at its next session.

Harbin Tramway Construction.—Construction work on the Harbin tramway began on July 29. It is expected that it will be completed in July next year. Materials have been supplied by Siemens (China) Co. while the principal contractor is the An Tai Co., who built the tramway in Peking.

The Harbin tramway is a joint enterprise of the provincial government and the merchants. An initial expenditure of \$710,000 has been duly paid, but it is feared that the difficulty of raising the second instalment may cause an interruption of work.

Refrigerator Cars in China.—The first refrigerator car in China has recently been put in service on the Shanghai-Nanking Railway. This is one of the 21 refrigerator cars ordered from Belgium by the Ministry of Communications.

Nine of these cars are to be appropriated for use on the Tientsin-Pukow Line, five on the Shanghai-Nanking Line, four on the Peking-Mukden Line, and three on the Shanghai-Ningpo-Hangchow Line.

The cars have each a loading capacity of about 22 metric tons; empty weight is about 30 metric tons.

Three New Trust Companies in Japan.—The Finance Ministry has approved the establishment of the Konoike, the Kashima Trust and the Chugoku Trust Companies.

The Konoike Bank of Osaka, has purchased the Setsuyo Trust Company, capitalized at Y.1,000,000, and increased its capitalization to Y.20,000,000, renaming it the Konoike Trust Company. Baron Z. Konoike, president of the bank, becomes president of the new institution.

The Kashima Bank, Osaka, has taken over the interests of the Japan Hypothec Company, Tokyo, capitalized at Y.1,000,000, and the Mansei Trust Company, capitalized at Y.500,000, reorganizing them under the name of the Kashima Trust Company with a capitalization of Y.20,000,000. It will have its head office in Osaka and a branch in Tokyo. Mr. K. Hirooka, president of the bank, heads the new company.

The Chugoku Trust Company, capitalized at Y.5,000,000, has been formed by Mr. M. Ohara, a noted banker and business man of Okayama, and will have its head office in that city.

Minor trust companies in Osaka and Kobe are also discussing plans for an extensive merger.

Steam And Motor Boats on Yangtze Increase.—Steam and motor navigation has again increased by leaps and bounds on the Yangtze. The number of vessels which have navigated between Ichang and Chungking has risen from 43 during 1924 to 58 during 1925, and 10 new vessels are expected on the run in the near future.

The tendency of building smaller vessels, as foreshadowed in the 1924 Trade Report, has been maintained, and the majority are of such draught and tonnage that they can ply all the year round. Also, motor vessels are finding favor and oil burners are preferred to steamers. Of these latter, several are intended to be converted into vessels consuming liquid fuel, of which a steady supply at steady prices is obtainable, while local coal is neither dependable as regards supply, quality, or price.

In spite of the great increase in tonnage, freight rates have, on the whole, been maintained on a paying basis, even during the high-water season, when the smaller vessels were naturally handicapped by the advent and greater capacity of the summer fleet, and when unsettled conditions in Shanghai and locally affected freights adversely.—Chungking Customs Report, 1925.

Express Locomotives with Individual Axle Drive for the Dutch East Indies

(Continued from page 481).

isolating switches are mechanically interlocked with the main switch of the locomotive; they can only be opened after the main switch has been tripped.

The sanding gear allows the leading and third driving wheels to be sanded, independent of the direction of running; four electro-pneumatic valves, operated by pedals from the cabs, are fitted. The conductors to these valves are led over a reversing switch.

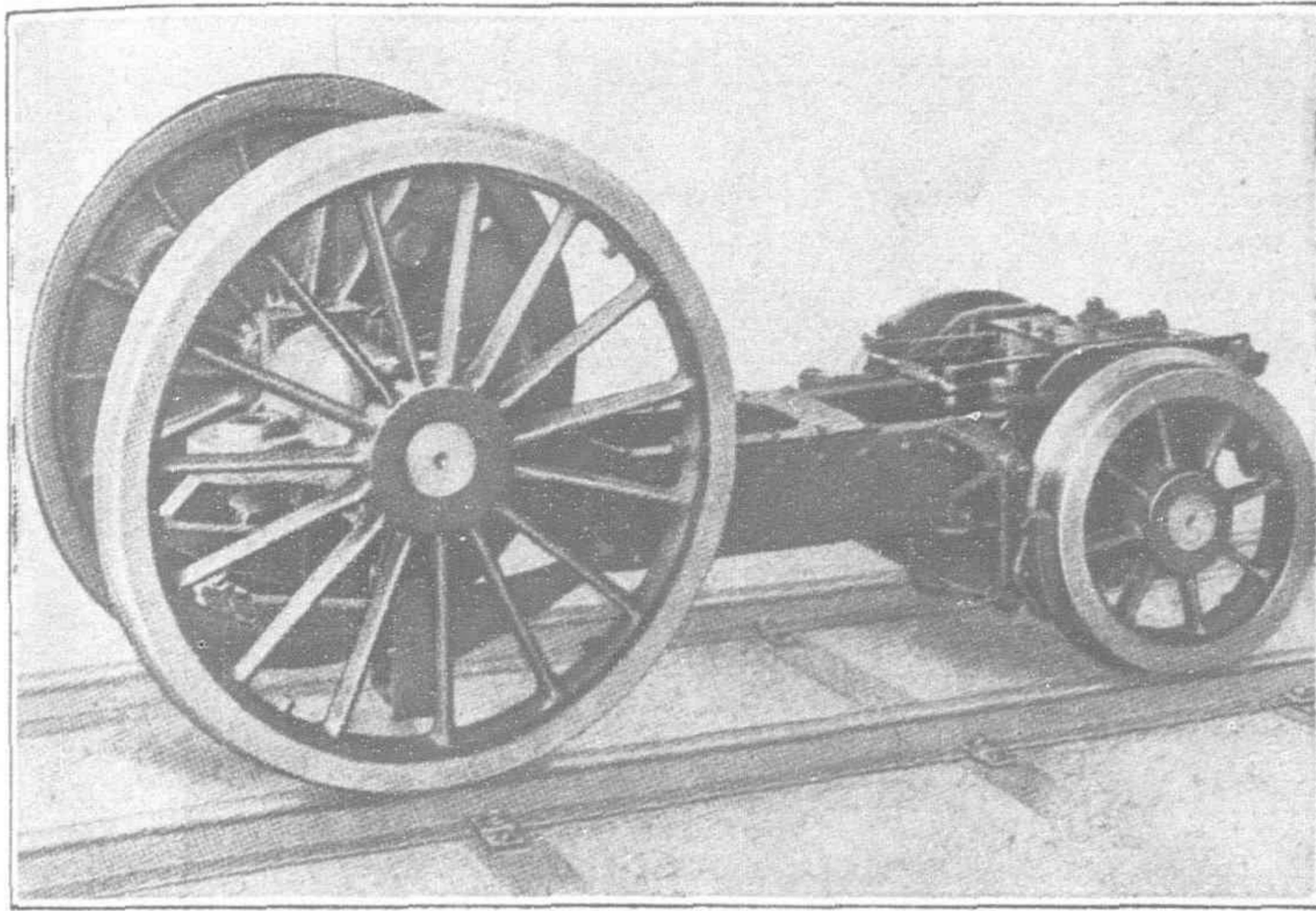


Fig. 6.—Bogie of the Brown Boveri Locomotives, as used on this Railway

Japanese Government Largest Buyer of Foreign Goods.—Emphasis placed by the United States Department of Commerce on governmental purchases in Japan, has caused a number of commercial men to change somewhat their plans for Oriental tours.

So important a buyer and consumer of foreign goods is the Japanese Government, that the department is urging commercial men to spend more time in Tokyo.

The department's guide book, which has just reached the coast, says that practically half of the total imports in Japan are on orders placed by the Imperial Government. Railways, tobacco, camphor, army and navy being government concerns require heavy purchases of foreign materials in their ordinary maintenance.

What many concerns seeking business in Japan for the first time do not know, is that government purchases are made through a number of limited qualified firms, most of which have their central offices in Tokyo.

The new guide books has the latest information and every effort has been made to make it authoritative. Pacific coast firms have requested a large consignment of them. (United Press)

A Singapore-Built Motor Boat

(Continued from page 465).

The bridge deck, the forward end of which is for first-class passengers, is provided with six double-berthed cabins, three on each side, fitted with settees and wash-basins. Aft of these cabins is fitted a bathroom. The dining saloon is formed between the cabins and a wooden partition at the aft-end of the bathrooms. The forward end of the bridge deck is fitted with glass screens and sliding windows, forming between this and the forward end of the cabins a spacious, comfortable lounge. Aft of the first-class accommodation the second-class passengers are located.

The ship is lighted by electricity, and fans are fitted to all cabins and the dining saloon, the current being supplied by a dynamo direct-coupled with a 20 b.h.p. Deutz oil engine, which also provides power to the electric winches and windlass.

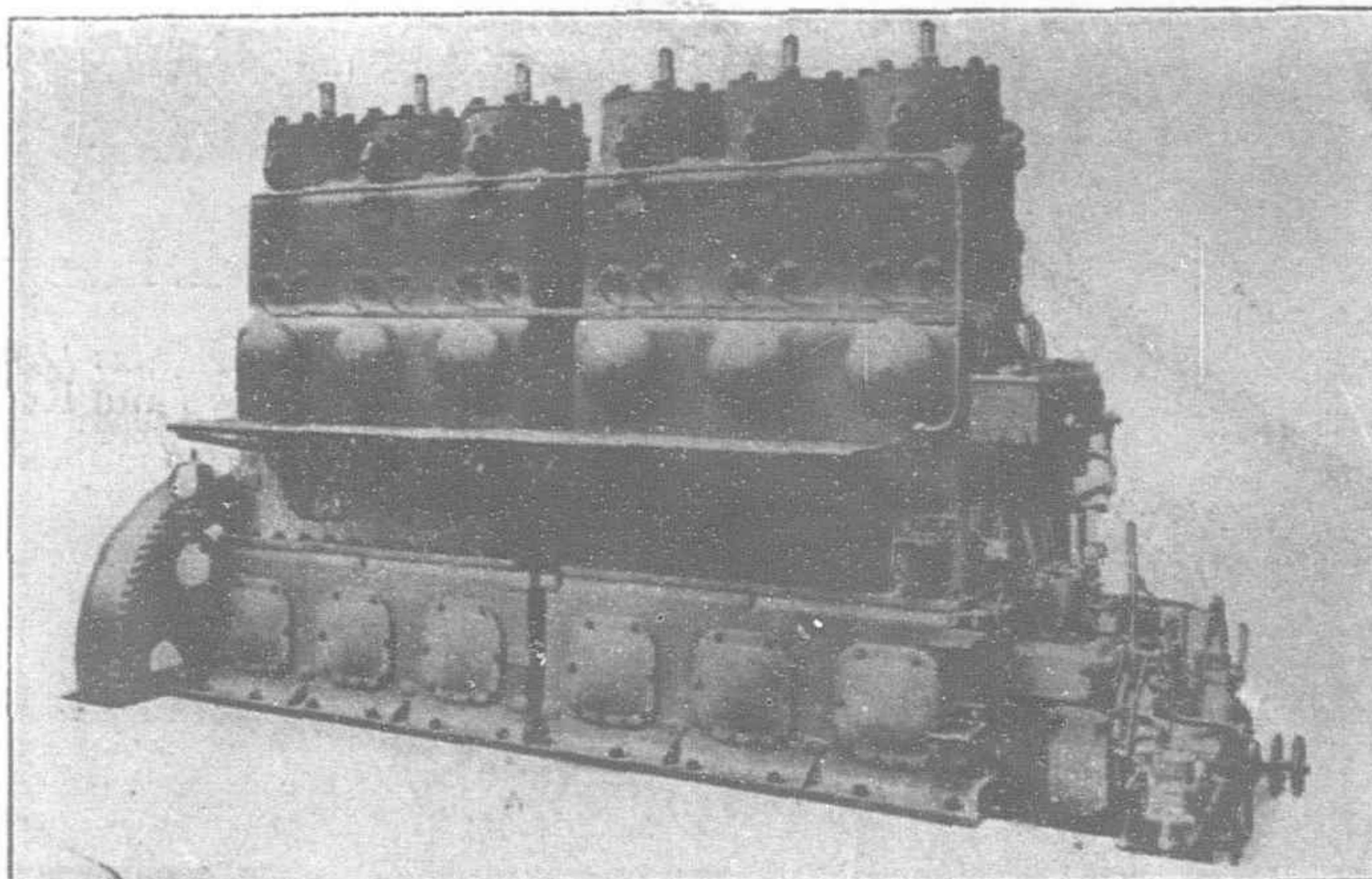
The main propelling engines fitted are two three-cylinder Deutz Diesel sets of 150 b.h.p. at 300 r.p.m. The main fuel tanks are situated in the after hold, close up to the after engine-room bulkhead.

The moderate dimensions of the whole plant have enabled the owners to carry much more cargo than vessels of the same dimensions and fitted with steam sets, besides being much cleaner.

SULZER BROTHERS

SHANGHAI ENGINEERING OFFICE

4 AVENUE EDWARD VII.



**6 CYLINDER AIRLESS INJECTION DIESEL ENGINE
300 BHP 300 RPM**

Maximum Simplicity—Highest Overall Commercial Efficiency; No Hot Bulb; No Pre-Heating; No Ignition Device; No Camshaft; No Exhaust Valves.

Exceptionally Low Lubricating Oil Consumption, 0.6gr (0.00132 lbs) per BHP hour or 0.18 kg (abt 0.4 lbs) per full-load working hour for the engine shown

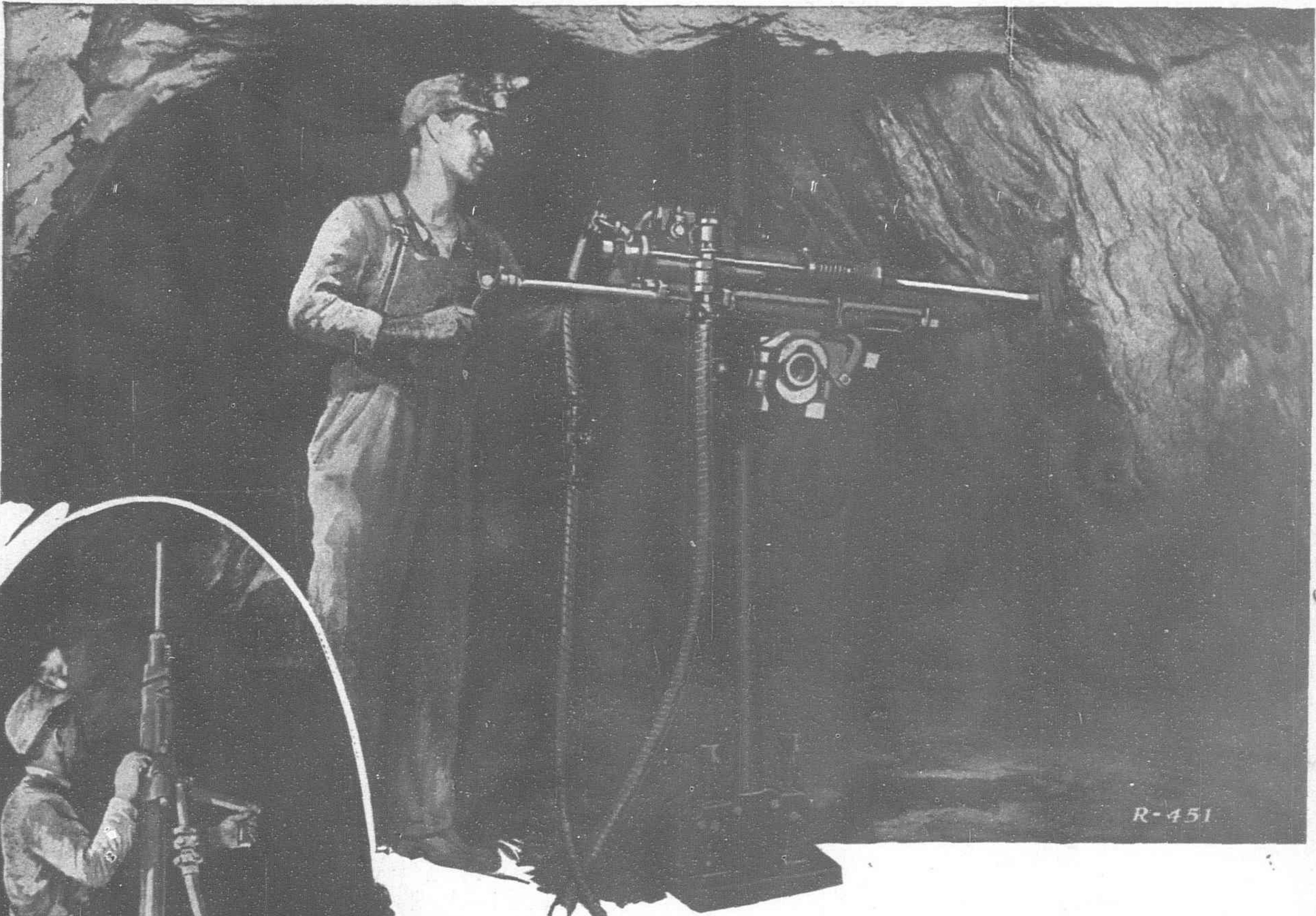
We supply also Marine Engines of this type

Uniflow Steam Engines, Air and Gas Compressors, Upright Watertube Boilers, Cornish and Lancashire Boilers, High and Low Lift Centrifugal Pumps, Fans and Ventilators for all purposes, Fire Engines, Stationary and Marine Diesel Engines, AIRLESS INJECTION DIESEL ENGINES, Ice-making and Refrigerating Plants, Maag Gears and Maag Planing Machines.

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R-451

Cutting Upkeep Costs

The worth of a machine—whether it is the smallest rock drill or the largest air compressor—is determined, not by its initial cost, but by service rendered and the cost of operation and maintenance.

The name INGERSOLL-RAND on a machine assures both owner and operator of long, uninterrupted, efficient performance with the lowest upkeep cost.

To owners it guarantees the highest standard of materials, and workmanship by skilled mechanics using the most modern shop equipment, with the result that I-R Machines are equal to the most severe service.

To thousands of operators in many branches of industry the use of I-R machines gives assurance of ease of operation and prolonged service with little if any lost time for repairs.

All this has been made possible by capable engineers, each expert in his line, through years of experience in the field. These men are always at your service, ready to help you solve your problems.

Then too, there are branch offices and service men in every part of the world.

We will be glad to send you descriptive bulletins.

Ingersoll-Rand Co., 42 Kiangse Road, Shanghai, China

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